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IMPROVED COMPUTER PROGRAMS FOR CALCULATING POTENTIAL FLOW IN PROPULSION SYSTEM INLETS

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16. Abstract

Computer programs to calculate the incompressible potential flow corrected for compressibility in axisymmetric inlets at arbitrary operating conditions are presented. Included are a statement of the problem to be solved, a description of each of the programs and sufficient documentation, including a test case, to enable a user to run the programs.

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INTRODUCTION

In the course of designing inlets at the Lewis Research Center, particularly for VTOL and STOL propulsion systems, a calculational procedure utilizing three computer programs evolved (refs. 1 to 4). The chief program is the Douglas axisymmetric potential flow program called EOD which calculates the incompressible potential flow about arbitrary axisymmetric bodies. The other two programs, original with Lewis, are called SCIRCL and COMBYN. Program SCIRCL generates input for EOD from various specified analytical shapes or sets of coordinate points for the inlet components. Program COMBYN takes basic solutions output by EOD and combines them into solutions of interest, and applies a compressibility correction.

These programs have been in a state of continual development over the past few years and in August of 1973 the then-current versions were published in a "Quick Release" form (ref. 5). Since that time all three programs have been sufficiently improved to make the versions of reference 5 obsolete and to warrant the publication of the latest version.

The present paper, then, is an update of reference 5 and consists of a statement of the problem to be solved, a description of each of the programs and sufficient documentation including a test case to enable a user to run the programs. The programs themselves are available from COSMIC, Computer Center, Information Services, 112 Barrow Hall, University of Georgia, Athens, Georgia, 30602. (Program EOD alone is also available through COSMIC with identification number LEW-12387.)

STATEMENT OF THE PROBLEM

The basic problem to be solved is to calculate the compressible potential flow in an arbitrary axisymmetric inlet at any combination of operating conditions of inlet mass flow rate, $\overline{W}$, free stream velocity V_∞, and inlet incidence angle, α (fig. 1). At nonzero incidence angle the flow in and around the inlet is three-dimensional. At the present time there is not available an exact practical compressible flow method of solution (computer program) capable of handling this inlet problem. Therefore, the problem is solved in several steps (programs):

(1) Geometry representation (Program SCIRCL)

(2) Incompressible potential flow basic solutions (EOD)

(3) Combined solutions with compressibility correction (COMBYN)

Each step and its corresponding program will be described in the next section.

DESCRIPTION OF SOLUTION STEPS AND PROGRAMS

Geometry Representation - Program SCIRCL

The inlet is assumed to be axisymmetric and is represented by its meridional profile. This profile is broken into segments at convenient tangent points as shown in figure 2. Each segment may be defined by an analytic expression or a set of points. The inlet duct walls and the outer surface (nacelle or bellmouth) must be extended far downstream (fig. 2) to facilitate obtaining accurate potential flow solutions in the inlet region of interest. The geometry program SCIRCL prepares coordinate-point input for efficient use of the potential flow program and also prints out information such as curvature, wall angles, flow area distribution, etc., which is useful in preliminary screening of proposed inlet shapes. In addition to the surface points, sets of points spanning the passage, like flow measuring rakes, are needed at axial locations where velocity profiles or streamlines are desired. At least one "rake" must be specified for use as a control station. (The function of the control station is given under COMBYN.) Program SCIRCL generates the coordinates of the rake points for input to EOD. Program SCIRCL will also produce Calcomp plots of the inlet goemetry and rake points and, optionally, area distribution and curvature distribution (see description of SCIRCL input).

Incompressible Potential Flow Basic Solutions - Program EOD

The Douglas-Neumann program EOD (refs. 6 to 8) is used for calculating the incompressible potential flow. Briefly, the program utilizes a distribution of sources or sinks of initially unknown strength σ to represent the inlet profile. This representation results in an integral equation (see refs. 6 to 8 for details) which is exact for a continuous distribution of source strength. This continuous distribution is approximated by representing the inlet profile by a finite number of discrete elements characterized by a point on the element (e.g., the midpoint) called the control point. Each element has the same predetermined type of source strength distribution (e.g., constant, linear, parabolic). This approximation results in a set of linear algebraic equations that are solved by matrix methods for the source strength at the control points. Velocities at the control points and at specified off-body points (rake points) are then calculated from the source distribution.

<u>Method of approximation.</u> - Two methods of approximation have been used as shown in figure 3: (1) the original method, called the lower order method, which has been in use at NASA-Lewis for several years; and

(2) the improved method, called the higher order method which was recently put into use.

The lower order method (ref. 7) uses flat (linear) surface elements and assumes constant source strength over each element (fig. 3(a)). To obtain solutions of adequate accuracy this method often requires very large numbers of elements and consequent long computer times.

The higher order method (refs. 9 and 10) uses curved (parabolic) surface elements and assumes a linear variation in source strength over each element (fig. 3(b)). For a given accuracy this method requires fewer elements than the lower order method with consequent savings in computer time. Conversely, a greater accuracy can be obtained within the element-number limitations of a given program-computer system with this method.

The program was originally written for closed bodies in a free stream. To apply the method to inlets, the inlets are idealized by adding artificial extensions to the inlet surfaces as shown in figure 2. The method of idealizing conventional inlets is given in reference 11 and that for lift fan or lift engine inlets in reference 2.

Types of basic solutions. - The program is used to obtain three basic solutions which are used in linear combination (to be explained under "Combined Solution, Program COMBYN" below) in order to satisfy the prescribed operating conditions (fig. 1). Two types of sets of basic solutions, as shown in figure 4, have been used at NASA-Lewis. The first is the closed-duct method (in use for several years) and the second is the shroud-vorticity method (recently put into use).

The closed duct method uses a combination of a closed-duct inlet (fig. 4(a)) and an open-duct inlet both in an axial freestream flow to obtain a static arbitrary mass flow. This method has some shortcomings as pointed out in reference 4.

The shroud-vorticity method (fig. 4(b)) utilizes a distribution of unit vortices (in addition to the distribution of sources that represent the inlet profile) on the shroud surface to induce a static mass flow through the inlet. Any arbitrary static mass flow can be obtained by the use of a multiplicative factor. This method does not suffer the shortcomings of the closed-duct method.

Possible solution procedures. - The two methods of approximation and the two methods of inducing static mass flow are independent of each other so that when they are used in all possible combinations there results four different procedures for the solution:

(1) Higher order approximation - shroud vorticity

(2) Higher order - closed duct

(3) Lower order - shroud vorticity

(4) Lower order - closed duct

In general, method (1) gives the best accuracy for the fewest points and is therefore the recommended method.

The choice of method of solution is input to program SCIRL and is passed on to EOD. The three basic solutions chosen are output by EOD for use by program COMBYN. No further description of EOD input or output will be given.

Combined Solution - Program COMBYN

This program combines the basic solutions $\overline{V}_j$, $j = 1, 2, 3$ from EOD into any number of solutions of interest. A solution of interest or combined solution $\overline{V}$ is one having specified values of free stream velocity V_∞ and direction α and inlet weight flow $\dot{W}$. The average axial velocity V_c at the control station may be input instead of $\dot{W}$. (If $\dot{W}$ is input, it is converted to V_c since V_c is required by the combination schemes.) Temperature and pressure must also be specified if other than standard conditions are desired. These and other COMBYN inputs are described later. (Note that COMBYN requires α_F rather than α where $\alpha_F = \alpha - 90.$)

The method of combination of the basic solutions is essentially that given in reference 2 and is illustrated in figure 5. However, the method of calculating the combination coefficients depends on the types of basic solutions, shroud-vorticity or closed-duct, chosen for EOD.

The velocity obtained by combination is incompressible and is corrected for compressibility by the Lieblein-Stockman compressibility correction (ref. 12).

$$V_{cor} = V_i \left(\frac{\rho_t}{\overline{\rho}_s}\right)^{V_i/\overline{V}_i}$$

where all the terms on the right hand side are obtained from the incompressible flow solution or the input flow conditions. This correction requires no alteration of the inlet geometry and it can handle local sonic and supersonic velocities. From the compressible velocity, V_{cor}, other flow properties (Mach number, pressure ratio, stream lines, etc.) are obtained.

One of the "rakes" mentioned under SCIRCL is used as a control station by COMBYN. The control station is the rake at which the average inlet axial velocity V_c of the combined solution is specified. If there are several rakes any one may be used as the control station. It should be noted, however, that the solution is most accurate in the vicinity of the control station since the compressibility correction does not exactly satisfy continuity.

Optional supersonic velocity correction. - When the velocity on the inlet surface becomes locally supersonic, the agreement between theory and experiment is generally not as good as when the flow remains subsonic. To improve the agreement an optional supersonic correction based on local streamtube area has been incorporated into the program. This correction affects only the supersonic velocities (and related quantities) on the surface and there will thus be some inconsistency between these corrected surface velocities and the rest of the local supersonic flow field. The supersonic correction is actuated by inputting NX as 1.

Optional force and momentum calculations. - Subroutine INFORC, which is activated by inputting an NX of -1, calculates surface forces and certain integrated quantities at the control station. (See COMBYN OUTPUT.) This subroutine was written for VTOL fan-in-wing and fan-in-pod inlets and therefore the quantities are VTOL oriented.

Thus, under the output heading "SURFACE INTEGRAL," subheading "LIFT" refers to forces in the direction of the inlet axis, positive pointing upstream. "DRAG" refers to forces normal to the LIFT direction, positive in the aft direction when the inlet is oriented vertically ($\alpha_F = 0$).

However, the quantities under the subheading "RESULTANTS" are oriented to the free stream direction and the "ANGLE OF ATTACK" is the ALFAF input to COMBYN. In this group "DRAG" is parallel to the free stream velocity vector, positive pointing downstream, and "LIFT" is perpendicular to the drag.

To illustrate these orientations, consider a conventional inlet at zero angle of attack. ALFAF is -90°. The first group of forces under "LIFT" are actually drag forces and those under "DRAG" are lift forces. However, under RESULTANTS the "LIFT" is lift and the "DRAG" is drag.

Other quantities should be adequately defined under "COMBYN OUTPUT."

When using INFORC at least two THETA's (0 and 180) must be input to COMBYN even when the flow is axisymmetric. When the flow is not axisymmetric more THETA's (say 3 or 5) are desirable.

DESCRIPTION OF SUBROUTINES

Figure 6 illustrates the calling relation between the main programs and their subroutines.

Program SCIRCL

(A) MAIN SCIRCL	Read all input, call required subroutine for each segment as requested, plot each segment after points are generated by subroutine; list points; plot curvature if requested; test for reworking of geometry if requested.

Straight Lines

(B) STRAIT	Generate points on a general straight line segment.
(C) FNSTRH	Generate points on final straight segment of a body.
(D) FRSTSH	Generate points on first straight segment of a shroud.

Ellipses

(E) TEST	Test superellipse input to see if mirroring about y-axis is required.
(F) PRELPS	Mirror superellipse input data about y-axis so that slope (1,2) is greater than slope (1,4).
(G) ELIPSE	Obsolete (see SUPERC)
(H) SUPERC	Generate points on a general bisuperellipse.
(I) FONISØ	Iterate on input conditions to find bisuperellipse exponents.

Other Curves

(J) CUBIC	Fit a cubic polynomial between two nonvertical parallel lines.
(K) SIMQ	Simultaneous solution of equations to obtain coefficients of the cubic polynomial.
(L) LEM	Generate points on a general Lemniscate.
(M) MIRROR	Mirror the hub points to obtain the shroud; primarily for 2-D inlets.

Direct Interpolation

(N) XYCALC	Executive routine for the following modules; purpose is to generate points "correctly" spaced along the curve defined by the list of input points. Inputs are used to develop double 3-point interpolating

(N) XYCALC (Cont.) polynomials in successive regions along curve. Polynomials are then used to suggest points, derivatives, etc. which can be tested for correct spacing as defined by standard criteria (see comments in SPGEN listing).

(O) SGEN

(P) DZTRP

(Q) SPGEN

(R) DNTRPC

(S) FNTRP

(T) FZTRP

(U) FNTRPC

(V) FNTRPA

(W) TLU

(X) LIMIT

Special Calculations; Output to EOD

(Y) WPUNCH Generate rake points at requested positions; plot rakes; write EOD input flags.

(Z) WRTXY Write remainder of EOD input flags and all X,Y coordinates.

(Z1) AREAA Compute simple disk area (neglecting centerbody) and actual inlet area (including centerbody if any); plot if requested.

Picture Plotting

(Z2) DRAW Plot x-y meridional plane picture of each inlet segment.

(Z3) PLOXIS Plot frames for inlet picture or other required plots; label axes

Utility

(Z4) SINTP Lagrange 3-point interpolation.

(Z5) SORTXY	Rearrange the values in an array, x, to increase with increasing index (ascending order); sort y accordingly.

System Library

ERTRAN	Routine which gives FORTRAN access to several UNIVAC 1110 operating system commands. Can be eliminated by defining unit 25 before execution.
SYMBOL SCALE LINE NUMBER PLOT	Standard CALCOMP routines needed for all plotting

Program COMBYN

(A) MAIN COMBYN	Executive calls to READS, GETABC, AVEV and, for each clock position, a call to ONOFF; write mass flow, station velocity and circumferential position on unit 4.
(B) READS	Read input parameters from unit 5. Read EOD output coordinates and velocities for the selection of basic flows solved. Plot any 3-D streamlines if required.
(C) CONST	Calculate most constants and intermediate parameters; list results; write on unit 4.
(D) VBARIT	Calculate average density ratio for compressibility correction.
(E) GETABC	Compute linear combination coefficients A, B, C to satisfy input flow conditions.
(F) INTPOL	Interpolate velocities and y-positions at end points of a rake, i.e., where rakes would intercept hub and shroud.
(G) AVEV	Calculate local velocities and densities at all body and rake points. Correct for compressibility; write basic velocities on unit 2 and combined velocities on unit 3.
(H) ONOFF	Call ONBODY and OFFBDY.

(I) ONBODY	Use velocities and densities to: calculate pressure ratios, Mach number, flow angles. List all these for onbody points, plot pressure ratio if desired.
(J) SRTNE	Calculate distance along body surface as function of x.
(K) BEFORC	Find all points on hub and shroud that are upstream of XTEST and below YWING. Write x, y, s, pressure ratios and velocities of these points on unit 4 for force calculations.
(L) OFFBDY	Same as ONBODY for rakes. Also, calculate weight flows for various stream tube heights.
(M) VAROFF	Calculate pressure ratios, Mach number, and flow angles for the rake endpoints found in INTPOL.
(N) NOEPTS	Determine number of rake points and endpoints that need to be interpolated by INTPOL to reach body.
(O) STRML	Calculate y-position at each rake for a group of streamlines, separated by weight flow increments of DELQ.
OFFORC	(Entry point in BEFORC) Parallel to BEFORC for all off body points on the control station rake at XTEST.
(P) INFRCE	Integrate pressure ratios along body curves and over all circumferential positions to find lift, drag, and moments.
(Q) LGRNGE	Lagrange interpolation for certain onbody variables at the exact YWING and XTEST positions.
(R) TRAP	Trapezoidal integration
(S) SINTP	See SCIRCL subroutines (duplicate)
(T) SORTXY	See SCIRCL subroutines (duplicate)
(U) PLOXIS	See SCIRCL subroutines (duplicate)

INPUT/OUTPUT UNITS

SCIRCL:	5 - standard card input
	6 - standard output list

SCIRCL (Cont.)	4 -	temporary storage. If flag J or E is 1, input to direct interpolation routines is written here.
	17 -	Saved. If flag A is 0, input for EOD consisting of X, Y points is written here (6E13.8).
EOD:	5 -	input (= 17 from SCIRCL)
	6 -	standard output list
	7 -	Saved. Input for COMBYN is written here (4E13.8); X, Y, V_x, V_y, etc.
	1-4, 8-16	Temporary storage
COMBYN:	5 -	standard card input; flow conditions, etc.
	6 -	standard output list
	4 -	temporary storage. If NX = -1, data for force calculations are written here.
	7 -	input (from EOD 7 above)
	2,3 -	temporary storage

DESCRIPTION OF INPUT AND OUTPUT

SCIRCL Input

Card no.	Format	Col. no.	FORTRAN name	Description
	9A6	1-54	ARE	= title for area plots. "CROSS-SECTIONAL AREA, SQ. IN."
	9A6	1-54	EX	= title for x-axis. "AXIAL POSITION, IN."
	9A6	1-54	CURVO	= title for curvature plots. "CURVATURE ON SHROUD"
	9A6	1-54	SURFAC	= title for x-axis with surface distance plots. "DISTANCE ALONG SURFACE FROM DOWNSTREAM END OF SHROUD, IN."

These first four cards above will be unchanged for all runs and can be made a part of the execution setup deck, or replaced with data statements.

Card no.	Format	Col. no.	FORTRAN name	Description
1	9A6	1-54	TITLE	Description of case
		FOR CALCOMP PLOTTING OF INLET PICTURES		
2	6F10.2	1-10	XX	Length, in plot-inches, of X-axis required
		11-20	XMIN	Value, in data-inches, of far left X-point
			EXEP	Data-inch per plot-inch along X-axis
		31-40	YY	Length in plot-inches, of Y-axis required.
		41-50	YMIN	Value, in data-inches, of bottom Y-point.
		51-60	ORD	Data-inch per plot-inch along Y-axis (usually equal to EXEP)
		FOR INFORMATION TO BE PASSED ON TO EOD:		
3	4I1,10X,I1	1	IGEOMF	"Use flat elements (1), use curved (0)"
		2	ISIGF	"Use constant (2), linear (1), or parabolic (0) source densities"
		3	ICURVN	"Read in curvature values (1)"; "EOD will compute curvatures (0)"
		4	NONEWF	"Use old velocity formulae (1)"; "New formulae (0)"
		15	IVORT	"Perform axisymmetric, closed-duct soln. (1)"; perform strip vortex soln. (0).
		FOR INFORMATION USED BY SCIRCL:		
4	2A6, I4, 2I1, 2I2, 10X, I1, 9X, 3I1, 2I2	1-6	IDENT	6-character tag for case, I.D.
		7-12	PROG	EOD

Card no.	Format	Col. no.	FORTRAN name	Description
4		13-16	NO6	1 for basic EOD data only 0 for full EOD solution
	(FLAG 'A')	17	LPNCHO	1, Do not save the output for EOD on unit 17
	" B	18	IPLOTA	Plot inlet area against X position
	" C	19-20	IPLOTC	-1, Plot curvature against X +1, Plot curvature against S
ALL FLAGS are 'on' when =1, unless otherwise noted. (Either E or J or neither can be on, but not both)	" D	21-22	IREAD	0 (obsolete)
	" J	33	IAB	Redo geometry from point (XAA, YAA) to (XBB, YBB)
	" E	43	IREDON (1)	Redo entire geometry via direct interpolation.
	" F	44	IREDON (2)	LPNCHO for any redo.
	" G	45	IREDON (3)	IPLOTA for any redo.
	" H	46-47	IREDON (4)	IPLOTC for any redo.
	" I	48-49	IREDON (5)	IREAD for any redo.
Skip card 5 if J=0				
5	4F12.5	1-12	XAA	X position of starting point for partial redo.
		13-24	YAA	Y position of starting point for partial redo.
		25-36	XBB	X position of ending point for partial redo.
		37-48	YBB	Y position of ending point for partial redo.

Card no.	Format	Col. no.	FORTRAN name	Description
6	5F10.2	1-10	ANBDYS	Number of bodies (can handle 3) =1.0 shroud only =2.0 hub and shroud
		11-20	DELS	Spacing between points in region of interest
		21-30	DELSMX	Maximum spacing far from region of interest
		31-40	XRI	Axial distance at which surface distance equals zero.
7	I4	1-4	NRAKES	Number of axial locations at which data across the passage is desired, must be at least one (for the control station), cannot be greater than 25.
8	3F8.5,I3	1-8	XRAK	Axial location of rake ($XRAK_i \leq XRAK_{i+1}$).
		9-16	YLO	Y value of first point on the rake at XRAK. If YLO = 0.0, the program will calculate a reasonable value for YLO provided the slope of nearby surface is not >45°.
		17-24	YHI	Y value of last point on the rake at XRAK. If YHI = 0.0, the program will calculate a reasonable value for YHI provided the slope of nearby surface is not >45°.
		25-27	NY	Number of points in rake at XRAK. Restriction, $\Sigma NY \leq 200$ $\Delta Y = \frac{YHI - YLO}{NY}$ Rake points are equally spaced, ΔY, between YHI and YLO.
9	2F10.2	1-10	TYPBDY	=1.0 for hub =2.0 for shroud =0.0 if shroud is to be mirror image of hub

Card no.	Format	Col. no.	FORTRAN name	Description
				NOTE: A hub-only case (no shroud) can be handled by breaking the hub into at least two segments and inputing the first segment as a hub and the remaining segments as a shroud. This will go through SCIRLE and EOD but not through COMBYN. Examples that might use this option are windmill or turboprop hubs.
		11-20	ANSEG	= Number of segments for the particular body = Y centerline used for mirroring if TYBDY=0 = 0 for direct interpolation option over the entire body (see cards 11a and 12a input instructions)
10	3F10.2	1-10	ENREED	Code indicating type of curve to be fitted through given points. 0., for bisuperellipses. See table I and figure 7 for available options. Input 4,5, or 6 (XIN, YIN) points as directed. = 1000., same as =0. but with finer point spacing near one end of segment (2 such segments required). Usually used to give finer spacing at the highlight. The superellipse going into the highlight and the one on the topside of the highlight should have this flag. For bisuperellipses where the '1000' option is to be used, the rate at which the point spacing, ds, changes near one end $ds_i = ds_{i-1} - (rate) \cdot (ds_{i-1})$ can be specified on input. The rate (internal name = PACE) is entered as the fractional part of ENREED for each such segment. For example, if ENREED were input as 1000.06, the spacing for consecutive points would be evaluated as follows: $DS_i = DS_{i-1} - (0.06)\ DS_{i-1}$ if segment is to go from large-to-small spacing.

Card no.	Format	Col. no.	FORTRAN name	Description
				or:
				$DS_i = DS_{i-1} + 1.5\ (0.06)\ DS_{i-1}$ if segment is to go from small-to-large spacing.
				If PACE is entered as zero. (i.e., ENREED=1000.) The default value, PACE=.05, will be used.
				(PACE $\leq$ 0.133)
				*The first '1000' superellipse ON A BODY reduces the point spacing as far as possible, down to a limit of 2 percent of the ds value at the beginning of the segment.
				*All subsequent '1000' superellipses input will increase ds as far as possible up to the input value DELS.
				*Any number or types of segments may be input between the first and subsequent '1000' bisuperellipses, with the exception of a normal bisuperellipse (ENREED = 0.).
				= 1, is a straight line, input 2 coordinates (XIN(1), YIN(1), XIN(2), YIN(2)). (fig. 8(a))
				The last straight line on the hub and the first and last straight lines on the shroud will automatically have their spacing increased from approximately DELS near the region of interest to approximately DELSMX away from the region of interest.
				The first straight line on the shroud must be equal in axial length to the last straight segment on the hub. (If the actual straight lines are not equal in length, the longer should be input as two segments.)

Card no.	Format	Col. no.	FORTRAN name	Description
				= 10, special straight line used for closed bodies (example - airfoils). This straight line starts with large spacing (DELSMX) and ends with the small spacing (DELS). Input 2 coordinates. (fig. 8(b)).
				= -1, fits a lemniscate between a straight line and a point. Input is 3 coordinates (fig. 8(c))
				= -3, fits a cubic between 2 straight lines, input 4 coordinates (fig. 8(d))
				= 99. for direct interpolation option over one segment (see input instructions for card 12, 11a)
		11-20	REEDEN(1)	(See table I) Input exponent of X-term in bisuperellipse equation. Blank for all other segment types.
		21-30	REEDEN(2)	(See table I) Input exponent for Y-term of bisuperellipse.
11	6F12.5	1-72	XIN(I) I=1,2,3,6,4,5	X-coordinates of specified points.
12	6F12.5	1-72	YIN(I) I=1,2,3,6,4,5	Y-coordinates of specified points.
				NOTE: If ENREED=99.: instead of using cards 11 and 12, input the following cards,
11a	Namelist/<u>$BODYIN</u>/		Z(I) I=1, up to 300	Z is a complex array containing the X value (in the real part) and Y value (imaginary part) of each given point along the segment. The namelist will normally be longer than one card.
12a	Namelist/<u>$AUXIN</u>/		DONE	= a logical variable which should be input as = .TRUE.
				NOTE: If ANSEG=0 and TYPBDY $\neq$ 0, skip card No. 10, and substitute 11a for 11 and 12a for 12.

Input deck structure. -

Card no.

1
2
3
4
5 (only if flag J > 0)
6
7
8
.
. Number of '8' cards = NRAKES
.
8
9

10
11 Number of '10-11-12' groups for each '9' card = ANSEG
12
. *If ENREED = 99, on card #10, use #11a instead of 11 and #12a instead of 12.
.
.
10 *If ANSEG = 0, and TYPBDY ≠ 0, on card #9, skip #10 and substitute #11a for 11, and #12a for 12.
11
12

9 Number of '9' cards = ANBDYS

10
11
12 Figure 9 shows a SCIRCL input form, reflecting the above instructions.
.
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SCIRCL Output

Printed output. -

Input file dump (a list of input cards)

Case number and title

Input card number 3 (EOD flags)

Input card number 4 (case I.D. and SCIRCL flags)

Input card number 6 (number of bodies, DELS, DELSMX, and XRI)

Total number of points for all bodies should not exceed 400. Total for any one segment of a body should not exceed 200. An error message will indicate if these limits have been passed. Total number of off-body points must not exceed 200.

Hub segment data, followed by shroud segments. For each segment:

ENREED (as input) and type of segment

Data depending on type of segment

Straight line

X	X(1)	X(2)
Y	Y(1)	Y(2)

Last point data*

Bisuperellipse

Exponents

P as read in	X	X(1)	X(2)	X(3)	X(6)	X(4)	X(5)
Q as read in	Y	Y(1)	Y(2)	Y(3)	Y(6)	Y(4)	Y(5)
P as used	A	XO					
Q as used	B	YO	OMEGA				

where A & B = Semimajor and minor axes of the transformed superellipse

XO & YO = Center of the transformed superellipse

OMEGA = The difference (in radians) between the slopes of the end point slope lines minus $\pi/2$ (i.e., OMEGA is a measure of the nonperpendicularity of the slope lines).

Number of iterations**
Iteration data***
Last point data*

'Magic triangle' messages refer to the triangle formed by extending the superellipses' slope lines toward each other and drawing a chordline between input points number (X_2,Y_2) and (X_4,Y_4). Input points (X_3,Y_3) and (X_6,Y_6) must lie within this triangle, or, for certain special cases, may lie in a similar triangle on the <u>opposite</u> side of the chordline.

If input points (X_3,Y_3) and/or (X_6/Y_6) fall outside the magic triangle, the following message (or messages) is printed:

"This point is below the magic triangle . . ."

or:

"This point is outside the magic triangle . . ."

Cubic

X	X(1)	X(2)	X(3)	X(4)
Y	Y(1)	Y(2)	Y(3)	Y(4)
A	B	C	D	

where A, B, C, and D are the coefficients for the cubic $AX^3 + BX^2 + CX = Y$

Number of iterations**
Iteration data***
Last point data*

Lemniscate

X	X(1)	X(2)	X(3)
Y	Y(1)	Y(2)	Y(3)
THETMX CALC			ACALC

where

THETMX CALC = angle between line 1-3 and line 1-2

ACALC from equation $R^2 = 2A^2 \sin 2\theta$ where A = ACALC, θ = THETMX and $R^2 = (XIN(3) - XIN(2))^2 + (YIN(3) - YIN(2))^2$.

Number of iterations**
Iteration data***
Last point data*

*Last point data. This is the coordinate point data for the last point of the segment. It is presented here because it is overwritten by the first point of the following segment and therefore does not appear in the point-by-point array below.

**Number of iterations is the number of iterations required to achieve a satisfactory point spacing for EOD and have the calculated last point of the segment coincide with the input endpoint (to within a prescribed tolerance of 0.1 DELS). If this satisfactory spacing and end-point-matching is not achieved within 150 iterations, the following message is printed out above the number of iterations:

This set of data exceeded 150 iterations. Calculations stopped XBRK YBRK.

X(1), Y(1), X(2), Y(2), X(3), Y(3), X(4), Y(4), X(5), Y(5)

***Iteration data

DELS IN	value of ds at end of previous segment
DELS	value used to start final iteration for this segment
DELS OUT	value of ds at end of this segment, to be passed on to next segment
DSTEST	distance from last calculated point to input segment endpoint (should be less than .1*DELS; otherwise the "exceeds 150 iterations" message is printed)
FINAL PACE	the value of PACE at the conclusion (or termination) of the point-spacing iteration for bisuperellipses with ENREED $\geq$ 1000.

INPUT FOR THE COMBINE PROGRAM NT(1) = NT(2) = NHUBMX = NP =

(See COMBYN input section)

Body coordinates (a separate set for each body; body 3 has only point number and X and Y)

Point number
X - axial distance
Y - radial distance
KAPPA - curvature
DY/DX - slope
ALPHA - slope angle in degrees
S - surface distance measured from the first point of each body (same as SUMDS in EOD output)
S-S(2) - surface distance measured from SRI (same as S in COMBYN output)
DELTAS - distance between points

Rake Information

XRAK - Axial location of rake
YLO - Y value of first location on rake (either read in or computed value)
YHI - Y value of last location on rake (either read in or computed value)
NDY - Number of Y points on the rake, as input

Area Output List

I - point number of each shroud point
XON - axial location of shroud point
YON - Y value of shroud point
YONH - interpolated Y value on the hub at X = XON

AREA - Annular area between hub and shroud (if there is no hub, AREA is the disk area)
DISC AREA - area as if there were no hub
ENSUBK - local curvature parameter = $\dfrac{\text{KAPPA} * (\text{YON}-\text{YONH})}{\sqrt{1 + \dfrac{\text{YONH}}{\text{YON}}}}$

File output. - The output file (UNIT #17), written by SCIRCL , is used directly as input to EOD, either as cards or from a mass storage file, depending on how the user has set up UNIT #17. The file is primarily in 6E13.8 format, consisting of the on-body point coordinates and rake points.

Graphic output. - Standard Calcomp paper copies can be produced for each geometry run as follows:

(1) For all cases: an x-y, meridional 'picture' of the inlet with SCIRCL -generated on-body points denoted by the '+' symbol, and connected with straight lines; off-body rake points are denoted by a small square symbol; segment end points have a large octagonal symbol.

(2) For cases with IPLOTA = 1: a graph of cross-sectional area (both disk and annular) against axial distance, X.

(3) For cases with IPLOTC ≠ 0: a graph of shroud body curvature against axial position (IPLOTC = -1) or against distance along shroud. (+1)

COMBYN Input

English engineering units are used throughout the program.

- Length - inches
- Velocities - ft/sec
- Angles - degrees
- Pressures - lb/ft^2
- Temperature - degrees R
- Densities - $slug/ft^3$
- Force - lbs
- Weight flow - lbs/sec

Card no.	Format	Col. no.	FORTRAN name	Description
1	12A6	1-72	TITLE	Title card (columns 13-66 are transferred to pressure plots)
2	8I4	1-4	NT(1)	Number of on-body points for the closed-end solution.
		5-8	NP(1)	Total number of off-body points.
		9-12	NT(2)	Number of on-body points for the open-end solution (eliminate the last body).
		13-16	NP(2)	Total number of off-body points
		21-24	KSKIP	=0 for first case of COMBYN =1 for successive cases using the same EOD output.
3	10F8.5	1-8	VC	Average axial velocity at the control station. Based on live flow area, i.e., the flow area minus the area associated with the boundary layer displacement thickness. If WDOT $\neq$ 0, the program will interpret this as a code to ignore the input VC and will calculate VC from WDOT. (To run a case with VC actually equal to zero set WDOT = 0.0 and VC = 0.0.) If ICTLPT (card #5) is not zero, VC is interpreted as the speci-

Card no.	Format	Col. no.	FORTRAN name	Description
3 (Cont.)				fied pressure ratio (PS/P_T) at a 'control point' rather than a velocity. NOTE: all 3 inputs, WDOT, ICTLPT and VC, must be nonzero when the 'control point' calculation is desired.
		9-16	VINF	Free-stream velocity
		17-24	ALFAF	Angle of attack, 0.0 for free-stream perpendicular to inlet axis. Note that $\alpha_F = \alpha - 90°$. For "control point" cases only, ALFAF will be calculated when ALFAF is input as = 999.0.
		25-32	TTOTAL	Total temperature, if PSTAT and TSTAT are read in (to be explained later), the program will calculate TTOTAL. If TTOTAL = 0 and PSTAT and TSTAT = 0, then TTOTAL = 518.67 will be used.
		33-40	ELND	ELND is the arbitrary length used for scaling or normalizing Refer to KND input, card number 5. See also CUTOFF input below.
		41-48	YWING	Upper limit of integration for surface forces (used in subroutine INFRCE).
		49-56	UTIP	Rotor tip speed. Need not be input unless relative rotor inlet quantities are desired. (See COMBYN OUTPUT.)
		57-64	VA	Bulk velocity at control station, i.e., average inlet axial velocity based on geometric area. If VA = 0.0, the program will interpret this as a code and set VA = VC.
		65-72	PT	Total pressure. If PT = 0.0 and PSTAT = 0.0, the program will set PT = 2116. If PT = 0.0 and PSTAT ≠ 0.0, PT is calculated.

Card no.	Format	Col. no.	FORTRAN name	Description
3 (Cont.)		73–80	CUTOFF	If CUTOFF $\neq 0$, the pressure ratio P_s/P_t on the shroud will be plotted (on Calcomp) against dimensionless surface distance S/ELND starting at X=XRI and proceeding in both directions along the surface for a distance of S = CUTOFF. Length of plot in paper inches is 10 · (CUTOFF/ELND). There is one plot for each circumferential angle THETA.
4	10F8.5	1–8	PSTAT	Static pressure
		9–16	TSTAT	Static temperature. (If PSTAT and TSTAT are not 0.0, total pressure (PT) and total temperature (TTOTAL) will be calculated using PSTAT and TSTAT.
		17–24	WDOT	Weight flow – required unless VC $\neq 0$ and concurrently ICTLPT = 0.
		25–32	DELQ	Increment in mass flow fraction for spacing of calculated streamlines. NOTE: Default Value = 0.1, if DELQ is input as 0.
5	8I4	1–4	NTHETA	Number of THETA's where THETA is the circumferential coordinate. If NTHETA = 0, one THETA (THETA $\leq 70°$) will be read in and used as the initial angle for the start of 3-dimensional, on-body streamlines. For this option, THETA will vary as the streamline is followed up the shroud instead of remaining a constant on one meridian. NOTE: No INFRCE (force) calculations or pressure plots can be requested when NTHETA = 0.
		5–8	NCLO	One rake must be chosen as the control station. NCLO is the number of the first point on this rake.
		9–12	NCHI	The number of the last point on the control station rake.

Card no.	Format	Col. no.	FORTRAN	Description
5 (Cont.)		13–16	NX	If NX = −1, inlet total force calculations are obtained (Subr. INFRCE). If NX = +1, a supersonic velocity correction is activated. At those on-body points where local supersonic flow is detected, velocities and pressure ratios are readjusted based on local Mach numbers and the rate of change of the local velocities. (Since off-body points having supersonic velocity are not corrected, there will be an inconsistency between the corrected on-body points and adjacent off-body points.)
		17–20	KND	Flag for scaling variables before velocity and pressure calculations and also for nondimensionalizing after calculations and just before printout; Scaling: All input lengths and coordinates are divided by ELND immediately after being input, and WDOT is set to WDOT/ELND^2. If KND = −1, ELND = YTESTS 0, ELND = 1.0 (no scaling) +1, ELND = YTESTS − YTESTH +2, ELND = the read-in value from card #3 Nondimensionalizing: If KND = 8, the surface distance, S, will be divided by the read-in ELND just prior to printout. If KND = 9, the on-body X and Y coordinates will be divided by the read-in ELND just prior to printout. NOTE: If CUTOFF is nonzero, surface distance will automatically be normalized by ELND before printout.
		21–24	NOTHET	If = 1, WDOT and VC will be left constant, as input, for all values of THETA (neglecting crossflow term). If = 0/blank, WDOT and VC will be corrected for crossflow and will vary with THETA.

Card no.	Format	Col. no.	FORTRAN name	Description
5 (Cont.)		25–28	ICTLPT	Index number (from EOD output) of the desired 'control point' where a known pressure ratio is to be input in lieu of a control station velocity. See VC.
		29–32	ISWIRL	(Required when NTHETA = 0) Index number of point on shroud where 3-D, on-body stream-line calculation will begin; preferably near the fan face.
6	10E8.5	1–80	(THETA(I), I=1,NTHETA) NTHETA $\leq$ 10	Circumferential coordinate in degrees (number of THETA's read in depends on NTHETA)
7	8E10.5	1–10	XTEST	Axial location of control station rake. Must be compatible with NCLO and NCHI.
		11–20	YTESTH	Y on the hub at XTEST (control station)
		21–30	YTESTS	Y on the shroud at XTEST (control station)
8	3E10.5,I4	1–10	XRI	Value of X at which the surface distance is zero.
		11–20	YRIHUB	Y on the hub at XRI.
		21–30	YRISHR	Y on the shroud at XRI.
		31–34	NHUBMX	The number of the last point on the hub (this can be found in the printed output of SCIRCL).

Figure 10 shows a COMBYN input form reflecting the above instructions.

COMBYN Output

Printed output. -

TITLE - COMPRESSIBLE COMBYN APPROACH 5 followed by title on title card.

INLET GEOMETRY I.D. as carried forward from SCIRCLE input.

A list of the basic flow types obtained from EOD, followed by the values of several solution flags used by EOD.

In the table that follows, several functions of three different velocities are given. The velocities are:

Control; VC, Average axial velocity at the control station. (See Input) (The control station is determined by NCLO and NCHI.)

Bulk; VA, bulk velocity at the control station. (See Input)

Free stream, V_∞, free stream velocity.

The rest of the table is self-explanatory except perhaps the terms INC and COMP. INC means calculated from incompressible flow equations and COMP means calculated from compressible flow equations.

The rest of the output will be defined by the output name:

ALPHAF	Angle of attack of wing containing VTOL inlet (i.e., the angle between the free stream velocity and a line perpendicular to the inlet axis)
VINF/VC	V_∞/V_c
VINF/VA	V_∞/V_a
VC/VA	V_c/V_a
VSONIC	Critical velocity uncorrected for compressibility
VSONICC	Critical velocity at control station
WDOTCR	Corrected weight flow = $\frac{\text{WDOT} \times \sqrt{\text{THET}}}{\text{DEL}}$
TSTAT	Free stream static temperature
PSTAT	Free stream incompressible static pressure
PSTATC	Free stream compressible static pressure
ASTAT	Free stream static speed of sound

RHOSTAT	Free stream static density	
WDOT	Input mass flow	
VIC	Incompressible average vleocity at the control station	
TTOTAL	Free stream total temperature	
PTOT	Free stream total pressure incompressible	
PTOTC	Free stream total pressure compressible	
ATOT	Free stream stagnation speed of sound	
RHOTOT	Free stream stagnation density	
THET	TTOTAL/518.67	
DEL	PTOTC/2116.22	
INDEX	Index of input control point where P_s/P_t is specified	
PRESS. RATIO	The input value of P_s/P_t at the control point	
VCP	Compressible velocity at the control point (calculated from P_s/P_t)	Appears only if ICTPLT > 0
VBAR	Average axial velocity at the control point station (calculated from WDOT)	
RHOCCP	Compressible density at control point	
XRI	Input	
YRIHUB	Input	
YRISHR	Input	
HUB-TIP RATIO	YRIHUB/YRISHR	
LND	Length used for normalizing or scaling (see ELND input instructions)	
XTEST	Input	
YWING	Input	
NT	1 Input 2 Input	

NP	1 & 2, Input
NCLO	Input
NCHI	Input
NHUBMX	Input
NX	Input
KND	Input
KSKIP	Input
NOTHET	Input
ISWIRL	Input
V1	Average (over Y and THETA, where YTESTH ≤ Y ≤ YTESTS and 0 ≤ THETA ≤ 360) axial velocity at the control station for basic EOD solution #1, if ICTPLT = 0. If ICTPLT > 0, V1 is the resultant velocity at the control point for basic solution #1.
V2	Same as V1 except for basic EOD solution #2.
A,B,C	Coefficients of combination
VINFP	Incompressible free stream velocity "uncorrected" for compressibility from the input compressible value.
THETA	Input
WDOTT	Local weight flow at the circumferential station given by THETA (weight flow that would be obtained if the entire circumferential extent had the same properties as at the local THETA position)
VICT	Local VIC at given THETA (average axial velocity that would result from WDOTT)
V3	Local average (over Y where YTESTH ≤ Y ≤ YTESTS) control station velocity of crossflow basic solution #3 at the given value of THETA, if ICTPLT = 0. If ICTPLT > 0, V3 is the meridional velocity component at THETA for basic solution #3. Note that in either case, V3 is <u>not</u> like V1 and V2.

OTHER MESSAGES: "VRESON = _____ IS GREATER THAN VMAX. VCONC = _____." The velocity at a certain on-body point exceeds the allowable value for the local expansion condition so that the isentropic ratio term: 1. - VCONC is less than zero. Where, VCONC = $\frac{\gamma - 1}{2}\left(\frac{VRESON}{a_{tot}}\right)^2$.

"I EXCEEDS 20 ITERATIONS FOR RHOBAR. VBAR = _____, VCOMP = _____, RHOBAR = _____. VBAR HAS BEEN REDUCED TO VCOMP * RHOBAR/RHOTOT" Subroutine VBARIT attempts to find the average density at each axial location using the isentropic density ratio, the stagnation density (RHOTOT) and the average incompressible VBAR (based on weight flow and the cross section). It has failed. VCOMP is the 20th attempt at finding the compressible velocity and has been used to compute the RHOBAR that will be returned. The normally unchanged VBAR is adjusted to agree with these abbreviated results.

For NX = +1, supersonic velocity correction is operating and a message to that effect will appear each time a region of local supersonic flow is encountered on the body, and also when it ends. The body point number where these transitions occur will also be printed.

HUB OR SHROUD

ON-BODY POINTS

I	The index number of each on-body point
X	Axial distance
Y	Radial distance
VP	Velocity component tangent to body profile in an X,Y plane (meridional velocity)
VTHETA	Circumferential velocity component
VRES	Resultant velocity $\left(VP^2 + VTHETA^2\right)^{1/2}$
VBARI	Average incompressible velocity at a given axial location (X) if ISWIRL = 0. If ISWIRL ≠ 0, VBARI is replaced with the local value of THETA along the 3-D streamline.
BETA	Flow angle = $\tan^{-1}$(VTHETA/VP)
S	Surface distance from XRI
M	Mach number

RB/RT	$\bar{\rho}_c/\rho_t$ at axial location (X)
PSOPTC	Static to total pressure ratio, compressible = $\left[1 - 0.2\left(\frac{V}{a_t}\right)^2\right]^{3.5}$

OFF-BODY POINTS (RAKES)

(First Set of Rake Data)

I	Number of the off-body point (points without numbers in I column are interpolated points on hub or shroud)
X	Axial distance - for each rake
Y	Radial distance
VX	Axial velocity component V_x
VY	Radial velocity component V_y
VZ	Circumferential velocity component V_z
VRES	Resultant velocity = $\sqrt{V_x^2 + V_y^2 + V_z^2} = V_{res}$
VM	Meridional velocity component $\sqrt{V_x^2 + V_y^2} = V_m$
VAFT	Velocity component in aft direction = $V_z \sin\theta + V_y \cos\theta$ (VTOL inlet orientation)
VSPAN	Velocity component in spanwise direction = $V_y \sin\theta - V_z \cos\theta$ (VTOL inlet orientation)
RHOBR	$\bar{\rho}/\rho_t$
PSOPTC	Pressure ratio-compressible

Second Set of Rake Data

I, X, Y	Same as above
VBRI	Average incompressible velocity at a given axial location X
M	Mach number
ALPHA	Meridional flow angle = $\tan^{-1}(V_y/V_x)$, inlet oriented, cylindrical coordinate system.

BETA	Flow angle = $\tan^{-1}(V_z/V_m) = \sin^{-1}(V_z/V_{res})$, inlet oriented, cylindrical coordinate system
ETA	Underturning angle = $\tan^{-1}(V_{aft})/V_x)$, wing oriented rectangular coordinate system for VTOL inlet.
ZETA	Spanwise flow angle = $\tan^{-1}(V_{span}/V_x)$, wing oriented, rectangular coordinate system for VTOL inlet
PHI	Swirl angle = $\tan^{-1}(V_z/V_x)$, inlet oriented, cylindrical coordinate system
QFRACT	Local (at a given x-station) cumulative weight flow between hub or axis and point in question divided by total weight flow at that x-station. If x-station is outside of inlet, control station weight flow is used for total weight flow. (Equivalent to stream function when flow is axisymmetric.)

RELATIVE ROTOR INLET DATA

X	Equal to XTEST
UTIP	Rotor tip speed
Y	Local radius at X = XTEST
U	Local rotor speed = $\frac{UTIP * Y}{YTESTS}$ at radius Y

The following quantities relative to a rotor rotating at tip speed = UTIP are calculated at circumferential location THETA.

VZPRIME	Circumferential velocity component relative to rotor = SIGN * VZ - U where SIGN = SIGN of sin θ
VPRIM	Relative velocity VM/cos β'
MPRIME	Relative Mach number = $(V'/a_t)/\left[1.0-0.2(V_{res}/a_t)^2\right]^{1/2}$
BETAPR	Relative flow angle = ATAN(V_z'/V_M)

The following are the same as above, but calculated at circumferential location 360-THETA.

VZPRST
VPRST
MPRS
BETAPS

RAKE WEIGHT FLOW DATA	(based on conditions at the local THETA but using the full circumferential area. Therefore, if VINF $\neq 0$ and ALFAF $\neq -90$, these are not the correct integrated values. The correct integrated value can be obtained by running several THETA's and properly averaging the results.)
I	The number of each rake
X	Axial location of the rake
$\frac{Q(I)-QBAR}{QBAR}$	Weight flow disparity parameter where Q(I) is integrated weight flow at rake #I and QBAR is integrated weight flow at control station
QSTOT	Total weight flow for each rake
QFR	Obsolete
QSTOTCR/ARAKE	Corrected rake weight flow divided by the flow area at the rake station
MBAR	One-dimensional Mach number at rake station based on QSTOTCR/ARAKE
QWALL	One-dimensional weight flow at rake station based on conditions at the outer wall (shroud).
QSTOT/QWALL	Flow coefficient, QSTOT ÷ QWALL

STREAMLINES (See comments above under RAKE WEIGHT FLOW DATA.)

There are streamline data for every r 'e position, X

QSTRM	Value of stream function (increment between streamlines is DELQ)
YSTRM	Corresponding y value

Output for optional subroutine INFORC:

CASE	Inlet geometry I.D., as carried forward from SCIRCLE input.
YTESTH	Input
YTESTS	Input
YWING	Input

VC Input

VINF Input

ALFAF Input

TTOTAL Same as TTOT, input

RHOT Free stream static density as computed from VINF

PA Obsolete

PAC Same as PSTATC input

MINF Mach number based on VINF

MC Mach number based on VC

NTHETA Input

SURFACE INTEGRALS

In general, the surface integral quantities are numerical integrals of the local surface static pressure minus the free stream static pressure (PAC). Integration is carried out over θ from 0 to 180. (Symmetry is assumed about the θ = 0 - 180 plane; e.g., conditions of θ = 270 are the same as at θ = 90.) Hub integrals go from the control station (XTEST, YTESTH) upstream to the axis; shroud integrals go from the control station (XTEST, YTESTS) upstream to the input value YWING.

TOTAL FORCE, LIFT, and DRAG differ in the area element used in the integration: TOTAL FORCE uses the actual surface area element; LIFT FORCE uses the component (or projection) of that element normal to the lift direction (see section "Optional Force and Moment Calculations"); DRAG FORCE uses the area component normal to the drag direction. LIFT and DRAG MOMENT's are the integral of the appropriate differential force (lift or drag) times the distance from the area element to the origin. MOM. ARM is the moment arm, i.e., the distance from the center of moments (origin) to the point where the entire lift or drag force would act to produce the given moment.

AREA is the integrated area over which the force integrations are carried out.

RESULTANTS are the force components in a coordinate system where the lift direction is perpendicular to the free stream velocity vector and the drag direction is parallel to the free stream.

ANGLE OF ATTACK is the ALFAF input.

MEASURING STATION INTEGRALS

X =	XTEST input

These integrals are carried out over the flow area at the control station.

AREA	
INT	Numerically integrated annular area between hub and shroud over which the various quantities are integrated.
EXACT	Annular area between hub and shroud calculated from hub and shroud radii. (Used as a check on the accuracy of the numerical integration.)
FORCE DUE TO PRESSURE	Integral of local static pressure at control station minus free stream static.
WEIGHT FLOW	Integrated weight flow
MOMENTUM FLUX	Integrated momentum flux
MOMENT OF MOMENTUM FLUX	Integrated moment of momentum flux about the inlet axis
DRAG FLUX	Integrated aft-directed momentum flux. (May be clarified by definition of AVERAGE VAFT following.)
AVERAGE VAFT	Integrated average of the local VAFT at the control station. Obtained from DRAG FLUX divided by WEIGHT FLOW.
VINF/VC	VINF divided by VC.
(VINF - VAFTAV)/VC	Obsolete
(VINF - VAFTAC)/VC	(VINF - AVERAGE VAFT) divided by VC
D/L	Obsolete
DC/LC	RESULTANT DRAG divided by RESULTANT LIFT

MISALIGNMENT PARAMETERS

DELV	Obsolete
DELVC	arctan (AVERAGE VAFT divided by VC)
DELM	Obsolete
DELMC	arctan (DRAG FLUX divided by MOMENTUM FLUX)

COMPARISONS	The two lines of output listed under this heading are obsolete.
LIFT	Obsolete
LIFTC	$\left(\frac{\text{WEIGHT FLOW}}{g} \times \text{VC} - \begin{matrix}\text{FORCE DUE}\\ \text{TO PRESS}\end{matrix}\right) \times \cos \text{ALFAF}$
DRAGP	Obsolete
DRAGPC	$\frac{\text{WEIGHT FLOW}}{g}(\text{VC} \sin \text{ALFAF} + \text{VINF}) - \begin{matrix}\text{FORCE DUE}\\ \text{TO PRESS}\end{matrix} \sin \text{ALFAF}$
DRAG	Obsolete
DRAGC	DRAGPC - DRAG FLUX cos ALFAF

Graphic output. - Standard Calcomp plots can be produced for a COMBYN case/run as follows:

(1) For each case with CUTOFF $\neq 0$, a plot of onbody static pressure ratio, P_s/P_t, against normalized surface distance on shroud, S/ELND (see CUTOFF, card #3). Two curves appear on each plot, one for points upstream from S = 0 and one for those downstream, toward fan. If S = 0 at the highlight, then one curve gives the internal pressure distribution and the other gives the external. One plot will be produced for each value of THETA read in from card #6.

or:

(2) (Not compatible with (1)) For each run (i.e., 1 or more cases, back to back), whose last case has set NTHETA = 0, a plot of the now-dependent variable THETA against axial position along a 3-D streamline. One curve is shown for each separate case of 'NTHETA = 0' included in the run.

NOTE: The highlight of the shroud should be at X = 0, in order to use this option. For purposes of display only, points on exterior of shroud (past highlight) are plotted with negative X positions.

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TABLE I. - BISUPERELLIPSE INPUT OPTIONS

[To fit a bisuperellipse, $(X/A)^P + (Y/B)^Q = 1$ between two given points (XIN(2), YIN(2)) and (XIN(4), YIN(4)), tangent (except case f) to the specified endlines (lines $1 \rightarrow 2$ and $4 \rightarrow 5$)*, and satisfying the additional listed conditions, set the input as indicated. (Do not input P, Q, or N as 1.0.)]

Fig. 7	Given condition(s):	Input the following:					
		REEDEN		XIN(3)	YIN(3)	XIN(6)	YIN(6)
		(1)	(2)				
a	One point (X_3, Y_3) (Superellipse)			X_3	Y_3		
b	One exponent, N (P = Q = N) (Superellipse)	N	N				
b	Two exponents, P and Q	P	Q				
c	One exponent P and one point (X_3, Y_3)	P		X_3	Y_3		
c	One exponent Q and one point (X_3, Y_3)		Q	X_3	Y_3		
d	Two points (X_3, Y_3) and (X_6, Y_6)			X_3	Y_3	X_6	Y_6
e	One point (X_3, Y_3) and its slope $(dy/dx)_3$			X_3	Y_3	$(dy/dx)_3$	-100.
f	X-location of inflection point X_3 and its slope $(dy/dx)_3$**			X_3	+100.	$(dy/dx)_3$	-100.
g	Curvature CAP at an endpoint (X_E, Y_E) where (X_E, Y_E) may be either (XIN(2), YIN(2)) or (XIN(4), YIN(4)).***			X_E	Y_E	CAP	200.
h	Curvature at end point (XIN(2), YIN(2)) is to be set equal to curvature at last point of previous segment***			XIN(2)	YIN(2)	999.	200.

*In general, lines $1 \rightarrow 2$ and $4 \rightarrow 5$ need not be orthogonal (fig. 7). If they are not, the bisuperellipse equation is $\left(\frac{X' + Y' \tan w}{A}\right)^P + \left(\frac{Y'}{B}\right)^Q = 1$, where $Y' = Y$ and $X' = X + Y \tan w$ and w is the angle of deviation from orthogonality. The angle w may be positive or negative depending on whether the angle β (fig. 7(a)) between lines $1 \rightarrow 2$ and $4 \rightarrow 5$ is acute or obtuse, respectively $(w = 90 - \beta)$.

**For this option: (1) no shear transformation is allowed, i.e., the endlines $1 \rightarrow 2$ and $4 \rightarrow 5$ must be orthogonal; (2) one endline must be horizontal; (3) only one endline is tangent to the curve; the other endline is orthogonal to the curve. See figure 7(f) for detailed restrictions. In general, a bisuperellipse will have an inflection if either P or Q is less than 1 and the other is greater than 1.

***For curvature options: (1) no shear transformations are allowed; (2) desired curvature, whether via input CAP (g) or previous segment (h), cannot be zero or infinite; (3) for curvature matching option (h) the slope angle at the curvature match endpoint cannot be 90° unless the previous segment is also a bisuperellipse.

LISTING OF PROGRAMS

```
SO.SCIRCLE                                                              05 MAY 77  13
C     PREPARE INPUT DATA FOR DOUGLAS POTENTIAL FLOW PROGRAMS EOD AND 22Y
C
C            SECOND VERSION   -  SPACING SPECIFIED
C
      DIMENSION REEDEN(2),ARE(9),EX(9),CURVO(9),SURFAC(9)
      DIMENSION CAPPER(200),DIST(200),KAY(4),TYP(4),IREDON(4)
      DIMENSION SD(500), S(500), NY(25)
      COMMON /SPREP/ KPREP,NIN
      COMMON /MNSO/ NNSO,NSOBDY(10)
      COMMON /NHIGH/ NSPHG,NLAST,XLAST(500),YLAST(500)
      COMMON /MWRTE/ IFLAG,NDY4,PROG,TITLE(9),BODIES(4),IDENT,YLO(25),YH
     1I(25),NDY(25),XRAK(25),NBPTS(5),NO6,NRAKES
      COMMON /FOR3SS/IC,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO18O
      COMMON /FOREOD/ IGEOMF,ISIGF,ICURVN,NONEWF,IVORT
      COMMON /SUPF/ IFLO
      COMMON/SEGNO/NSEG,J
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DFLS1,IHUB
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
C((((( THE GENERAL PLOTTING VARIABLES
      COMMON/ LOT/XMIN,YMIN,ORD,EXEP,XX,YY,LPNCHO,IPLOTA,MM
      COMMON/TITL/ TTITL(9,6)
      COMMON/TOL/BAGS(15),BAGX(15),ZAP(15),NZAP(15)
      COMMON/SENSE/  X(2),Y(2),A,B
      COMMON/PAC/ PACE,DELSHL
      DATA BLANK/6H      /
      DATA EODFF/6HENDOFF/
      DATA REDONE/6HREDONE/
      PI=3.14159265
      PIO18O=PI/180.
      PIO2=PI/2.
C
C     WHEN NO6 = 1, A FLAG IN CARD COLUMN 6 IS PUNCHED FOR 500
C      ONLY BASIC DATA WILL BE GIVEN IN 500 PROGRAM
C
      CALL PLOTID
C((((( READ AXIS LABELS FOR THE MOST POPULAR PLOTTED VARIABLES
      READ (5,500)ARE
      READ (5,500)EX
      READ (5,500)CURVO
      READ (5,500)SURFAC
      CALL ECHO
   10 NIN=25
      READ (25,500,END=630)TITLE
      IF (FLD(0,36,TITLE(1)).EQ.FLD(0,36,EODFF)) GO TO 630
      REWIND 4
      LOWER=0
C((((( READ GENERAL PLOTTING VARIABLES
      READ (25,555)XX,XMIN,EXEP,YY,YMIN,ORD
   15 FORMAT(4I1,10X,I1)
      READ (25,15)IGEOMF,ISIGF,ICURVN,NONEWF,IVORT
   20 READ (NIN,490)IDENT,PROG,NO6,LPNCHO,IPLOTA,IPLOTC,IREAD,IAB,(IREDO
     2N(I),I=1,5)
      LPDUM=LPNCHO
      IF(LPDUM.EQ.0)LPNCHO=1
      IF(LPDUM.EQ.1)LPNCHO=0
```

```
   25 JSTART=0
      JSTOP=0
      FACE=0.
      IF (IAB.LE.0) GO TO 30
      READ (NIN,625)XAA,YAA,XBB,YBB
      IBUMB=0
      WRITE (4,495)IDENT,PROG,NO6,(IREDON(I),I=2,4),IBUMB,(IREDON(I),I=2
     2,4)
C(((((( LEEHI WILL CONTAIN THE VALUE OF N AT THE HIGHLIGHT. NEEDED TO SP
C(((((( THE CURVATURE VS. X PLOTS INTO INTERNAL AND EXTERNAL PORTIONS
C(((((( MM COUNTS THE NO. OF SEGMENTS ON SHROUD AS PLOTTING PROCEEDS
   30 MM=0
      LEEHI=9000
C(((((( LOAD AXIS LABELS INTO COMMON
      IF (NIN.EQ.4) GO TO 40
      DO 35 I=1,9
      TTITL(I,1)=TITLE(I)
      TTITL(I,2)=BLANK
      TTITL(I,3)=ARE(I)
      TTITL(I,4)=EX(I)
      TTITL(I,5)=CURVO(I)
   35 TTITL(I,6)=SURFAC(I)
   40 WRITE (6,525)IDENT,TITLE
      IF (NIN.EQ.4) WRITE (6,470)
      IF (NIN.EQ.4) GO TO 55
      WRITE (6,45)IGEOMF,ISIGF,ICURVN,NONEWF,IVORT
   45 FORMAT(1H ,60HFLAG INPUT, 1ST RECORD - FOREOD. 2ND - PUNCH,PLOT,RE
     1DD FLAGS/1H ,4I1,10X,I1)
      IF (IVORT.EQ.0) GO TO 50
      IVORT=0
      GO TO 55
   50 IVORT=1
   55 WRITE (6,60)IDENT,PROG,NO6,LPNCHO,IPLOTA,IPLOTC,IREAD,IAB,(IREDON(
     1I),I=1,5)
   60 FORMAT(1H       2A6,I4,2I1,2I2,10X,I1,9X,3I1,2I2)
C(((((( PLOT THE AXES NEEDED FOR THE INLET PICTURE, AND LABEL THE CASE
   65 CALL PLOXIS(XX,YY,EXEP,ORD,XMIN,YMIN,.25,.25,0,0,1,2,1,1)
      CALL SYMBOL(-.3,YY-.5 ,.25,IDENT,0.,6)
      CALL SYMBOL(XX-1.50,.5,.25,IDENT,0.,6)
      IF(NIN.EQ.4)CALL SYMBOL(XX/2.,YY-.5,.25,REDONE,0.,6)
      IF (NIN.EQ.4) GO TO 75
C
C     READ INPUT CARDS FOR SUPERCIRCLE
C         1  -- CASE HEADER CARD -- NO. OF BODIES,CASE NO.,DELS,DELSMX
C      OFF-BODY
C         2 -- NRAKES = NUMBER OF RAKES (TOTAL NUMBER CANNOT EXCEED 25)
C         3 -- X,YLO,YHI, NY (DATA FOR EACH RAKE)
C                X = X OF THE RAKE,
C     YLO = Y OF THE FIRST PT. ON RAKE CLOSEST TO THE HUB - SHOULD BE
C                ABOUT DS GREATER THAN Y ON HUB
C     YHI = Y OF THE LAST PT ON RAKE CLOSEST TO THE SHROUD - SHOULD BE
C                ABOUT DS LESS THAN Y ON SHROUD
C              NY  = NO. OF PTS TO GENERATE FOR THAT RAKE
C     ON-BODY
C          FOR EACH SEGMENT A DESCRIPTION CARD IS NEEDED,
C            THIS CARD DENOTES THE TYPE OF LINE, AND THE
C            COORDINATES OF THE LINE (UP TO 6 SETS)
```

```
C
      READ (NIN,555,END=630)ANBDYS,DELS,DELSMX,XRI,ANNSD
      READ (NIN,485)NRAKES
      READ (NIN,550)(XRAK(I),YLO(I),YHI(I),NY(I),I=1,NRAKES)
      WRITE (6,480)ANBDYS,DELS,DELSMX,XRI
      DO 70 I=1,NRAKES

   70 NDY(I)=NY(I)-1
   75 NLAST=0
      NSPHG=0
      DSAVE=DELS
      DELS2=DELS
      DELS1=DELS
      NBDYS=ANBDYS
      NNSD=ANNSD
C
C     K = COUNTER FOR THE NUMBER OF ONBODY POINTS GENERATED
C     IHUB = 0, WHEN THERE IS ONLY ONE BODY-- IF THERE IS ONE BODY
C     IT MUST BE THE SHROUD.
C     IFLAG = 0, IF THERE IS MORE THAN ONE BODY
C
      K=0
      IHUB=0
      IFLAG=0
C
C     NZ LOOP IS FOR THE NUMBER OF BODIES
C
      DO 225 NZ=1,NBDYS
      IFLD=0
      IF (NZ.GE.2) IHUB=1
C
C     TYPBDY = 1 FOR HUB ---- TYPBDY = 2 FOR SHROUD
C            OR
C     TYPBDY=1 FOR HUB * TYPBDY=2 FOR FLOW SPLITTER *  =3 FOR SHROUD
C     *****FLOW SPLITTER PROGRAMMING IS NOT COMPLETE THROUGH COMBYN*****
C            OR
C     IF THE HUB IS TO BE MIRRORED , SET TYPBDY FOR THE SHROUD = 0.0
C
      READ (NIN,555)TYPBDY,ANSEG
      IF (IAB.GT.0) WRITE (4,555)TYPBDY,ANSEG
      NSEG=ANSEG
      IF (NBDYS.EQ.2.AND.NZ.EQ.2.AND.TYPBDY.NE.0.0) TYPBDY=3.0
      IF (NBDYS.EQ.1.AND.TYPBDY.EQ.2.0) IFLAG=1
      IF (TYPBDY.EQ.1.) WRITE (6,590)
      IF (TYPBDY.EQ.3.0.OR.TYPBDY.EQ.0.0.OR.NBDYS.EQ.1) WRITE (6,595)
      IF (TYPBDY.EQ.0.0) GO TO 215
      IF (TYPBDY.EQ.2.0.AND.NBDYS.GT.1) WRITE (6,600)
      K=K+1
      SON(K)=0.0
C
      IF(NZ.EQ.NBD)NSEG=NSEG-LOWER
C     SEGMENT LOOP
C
      DO 200 J=1,NSEG
C((((( DIRECT INTERPOLATION FLAG--
   80 IF (NSEG.EQ.0) GO TO 155
      READ (NIN,555)ENRFED,(REEDEN(I),I=1,2)
```

```
      IF (ENREED.EQ.0..OR.ENREED.GT.900.) WRITE (6,85)ENREED            A    1700
   85 FORMAT(1H ,8HENREED= ,F9.2)                                       A    1710
      IF (IAB.GT.0) WRITE (4,555)ENREED,(REEDEN(I),I=1,2)               A    1720
      IF (ENREED.EQ.99.) GO TO 155                                      A    1730
      READ (NIN,625)(XIN(I),I=1,3),XIN(6),(XIN(I),I=4,5)                A    1740
      READ (NIN,625)(YIN(I),I=1,3),YIN(6),(YIN(I),I=4,5)                A    1750
      IF (IAB.GT.0) WRITE (4,625)(XIN(I),I=1,3),XIN(6),(XIN(I),I=4,5)   A    1760
      IF (IAB.GT.0) WRITE (4,625)(YIN(I),I=1,3),YIN(6),(YIN(I),I=4,5)   A    1770
   90 KSV=K                                                             A    1780
      CAPPA(K)=0.0                                                      A    1790
      IF (ENREED.NE.1.0.AND.ENREED.NE.10.) GO TO 105                    A    1800
      XON(K)=XIN(1)                                                     A    1810
      YON(K)=YIN(1)                                                     A    1820
      WRITE (6,570)ENREED,(XIN(I),I=1,2),(YIN(I),I=1,2)                 A    1830
C(((((( KK= FIRST POINT ON CURRENT SEGMENT TO BE PLOTTED                A    1840
      KK=K                                                              A    1850
      IF (TYPBDY.GE.2.0) GO TO 100                                      A    1860
      IF (ENREED.EQ.1.0.AND.J.EQ.NSEG) CALL FNSTRH (K)                  A    1870
      IF (ENREED.EQ.1.0.AND.J.NE.NSEG) CALL STRAIT (K,0.0)              A    1880
                                                                        A    1890
                                                                        A    1900
      IF (ENREED.EQ.10.) CALL FRSTSH (K)                                A    1910
   95 DYDXO(KSV)=DYDXO(KSV+1)                                           A    1920
      ALPHA(KSV)=ALPHA(KSV+1)                                           A    1930
CC(((((( KR= TOTAL NO. OF POINTS TO BE PLOTTED FOR THIS SEGMENT         A    1940
      KR=K-KK                                                           A    1950
C(((((( PLOT CURRENT SEGMENT                                            A    1960
      CALL DRAW(KR,KK)                                                  A    1970
      GO TO 160                                                         A    2020
  100 IF (J.EQ.1) CALL FRSTSH (K)                                       A    2030
      IF (J.EQ.NSEG) CALL FNSTRH (K)                                    A    2040
      IF (J.NE.1.AND.J.NE.NSEG) CALL STRAIT (K,0.0)                     A    2050
      GO TO 95                                                          A    2060
  105 IF (ENREED.LT.-2.0) GO TO 150                                     A    2070
      IF (ENREED.LT.-1.0) GO TO 140                                     A    2080
                                                                        A    2090
      IF (ENREED.LT.0.0) GO TO 135                                      A    2100
C                                                                       A    2110
                                                                        A    2120
C     SET-UP SUPER ELLIPSE                                              A    2130
C                                                                       A    2140
      KPREP=0                                                           A    2150
      ENRD=ENREED-1000.                                                 A    2160
      IF (ENRD.LT.0.0) GO TO 110                                        A    2170
      PACE=ENREED-1000.                                                 A    2180
      IF(PACE.LE.0.)PACE=.05                                            A    2190
      ENREED=0.                                                         A    2200
      IFLD=IFLD+1                                                       A    2210
      GO TO 115                                                         A    2220
  110 IFLD=0                                                            A    2230
  115 WRITE (6,575)REEDEN(1),(XIN(I),I=1,3),XIN(6),(XIN(I),I=4,5),REEDENA    2240
     1(2),(YIN(I),I=1,3),YIN(6),(YIN(I),I=4,5)                          A    2250
      CALL TEST (5)                                                     A    2260
      ISTART=K                                                          A    2270
      KI=K                                                              A    2280
      KK=K                                                              A    2290
      CALL SUPERC(XIN,YIN,REEDEN,DELS1,ISTART)                          A    2300
```

```
      K=I0-1
      IF (NZ.EQ.1) GO TO 125
      KKKK=K-1
      DO 120 JE=ISTART,KKKK
      IF (XON(JE).EQ.XON(JE+1)) GO TO 120
      IF((DYDXO(JE)-DYDXO(JE+1))/(XON(JE)-XON(JE+1))*CAPPA(JE).LT.0.)CAPA
     1PA(JE)=-CAPPA(JE)
  120 CONTINUE
  125 K2=K
      IDUM=0
      IF (KPREP.EQ.0) GO TO 130
      CALL PRELPS (IDUM,1,5,K1,K2)
  130 KR=K-KK
      CALL DRAW(KR,KK)
      IF(ABS(XON(KK)-XAA+YON(KK)-YAA).LE.1.E-7)JSTART=KK
      IF(ABS(XON(K) -XBB+YON(K) -YBB).LE.1.E-7)JSTOP=K
      IF(JSTART.EQ.KK)MOD=NZ
      GO TO 160
C
C     SET-UP LEMNISCATE
C
  135 WRITE (6,580)ENREED,(XIN(I),I=1,3),(YIN(I),I=1,3)
      KK=K
      CALL LEM (K)
      K=K+1
      KR=K-KK
      CALL DRAW(KR,KK)
      IF(ABS(XON(KK)-XAA+YON(KK)-YAA).LE.1.E-7)JSTART=KK
      IF(ABS(XON(K) -XBB+YON(K) -YBB).LE.1.E-7)JSTOP=K
      IF(JSTART.EQ.KK)MOD=NZ
      GO TO 160
C
C     SET-UP ELLIPSE
C
  140 WRITE (6,585)ENREED,(XIN(I),I=1,4),(YIN(I),I=1,4)
      KPREP=0
      CALL TEST (4)
      K1=K
      KK=K
      CALL ELIPSE (K)
      K=K+1
      K2=K
      IDUM=0
      IF (KPREP.EQ.0) GO TO 145
      CALL PRELPS (IDUM,1,4,K1,K2)
  145 KR=K-KK
      CALL DRAW(KR,KK)
      IF(ABS(XON(KK)-XAA+YON(KK)-YAA).LE.1.E-7)JSTART=KK
      IF(ABS(XON(K) -XBB+YON(K) -YBB).LE.1.E-7)JSTOP=K
      IF(JSTART.EQ.KK)MOD=NZ
      GO TO 160
C
C     SET-UP CUBIC
C
  150 WRITE (6,605)ENREED,(XIN(I),I=1,4),(YIN(I),I=1,4)
      KK=K
      CALL CUBIC (K)
```

```
      K=K+1                                                             A    2880
      KR=K-KK                                                           A    2890
      CALL DRAW(KR,KK)                                                  A    2900
      IF(ABS(XON(KK)-XAA+YON(KK)-YAA).LE.1.E-7)JSTART=KK                A    2910
      IF(ABS(XON(K) -XBB+YON(K) -YBB).LE.1.E-7)JSTOP=K                  A    2920
      IF(JSTART.EQ.KK)MBD=NZ                                            A    2930
      GO TO 160                                                         A    2940
C((((((  NEW LINEAR INTEGRATION OPTION, BODY OR FULL INLET              A    2950
  155 KK=K                                                              A    2960
      KSV=K                                                             A    2970
      CAPPA(K)=0.0                                                      A    2980
      IF(NSEG.EQ.0)DELS1=DELSMX                                         A    2990
      CALL XYCALC(K,K2,MIN)                                             A    3000
      K=K2                                                              A    3010
      KR=K-KK                                                           A    3020
      CALL DRAW(KR,KK)                                                  A    3030
  160 IF (IAB.LE.0) GO TO 200                                           A    3040
      IF ((JSTART+JSTOP).EQ.0.OR.(JSTOP.GT.0.AND.K.GT.JSTOP)) GO TO 200 A    3050
      DO 165 K9=1,3                                                     A    3060
  165 BACKSPACE 4                                                       A    3070
      IF (JSTART.NE.KK) GO TO 180                                       A    3080
      WRITE (4,170)                                                     A    3090
  170 FORMAT(3X,3H99.,74X)                                              A    3100
      WRITE (4,445)XON(KK),YON(KK)                                      A    3110
      KK1=KK+1                                                          A    3120
      DO 175 K9=KK1,K                                                   A    3130
  175 WRITE (4,450)XON(K9),YON(K9)                                      A    3140
      BACKSPACE 4                                                       A    3150
      IF (JSTOP.NE.K) GO TO 180                                         A    3160
      WRITE (4,455)XON(K),YON(K)                                        A    3170
      GO TO 200                                                         A    3180
  180 IF (JSTOP.NE.K) GO TO 190                                         A    3190
      LOWER=LOWER+1                                                     A    3200
      KM1=K-1                                                           A    3210
      DO 185 K9=KK,KM1                                                  A    3220
  185 WRITE (4,450)XON(K9),YON(K9)                                      A    3230
      WRITE (4,455)XON(K),YON(K)                                        A    3240
      GO TO 200                                                         A    3250
  190 IF (JSTART.EQ.KK.AND.JSTOP.EQ.0) GO TO 200                        A    3260
      LOWER=LOWER+1                                                     A    3270
      KM1=K-1                                                           A    3280
      DO 195 K9=KK,KM1                                                  A    3290
  195 WRITE (4,450)XON(K9),YON(K9)                                      A    3300
  200 WRITE (6,205)K,XON(K),YON(K),CAPPA(K),DYDXO(K),ALPHA(K)           A    3310
  205 FORMAT(1H0,3X,11HLAST POINT ,2HK=,I5,4H, X=,E12.5,4H, Y=,E12.5,7H,A    3320
     1KAPPA=,E12.5,7H,DY/DX=,E12.5,7H,ALPHA=, E12.5)                    A    3330
C                                                                       A    3340
C     END OF SEGMENT LOOP                                               A    3350
C                                                                       A    3360
  210 GO TO 220                                                         A    3370
  215 KK=K+1
      CALL MIRROR (K,ANSEG)                                             A    3380
      KR=K-KK
      CALL DRAW(KR,KK)
  220 NBDPTS(NZ)=K                                                      A    3390
      NBDY1=NBDPTS(1)                                                   A    3400
      NBODY2=NBDPTS(2)                                                  A    3410
```

```
      TYP(NZ)=TYPBDY
      KAY(NZ)=K
  225 CONTINUE
C
C     END OF BODY LOOP
C
      ITOP12=K
      IF(IFLAG.EQ.1)NBODY2=ITOP12
      DELSND =DELS
      IF (IFLAG.EQ.1) NBDY1=0
C
C
C     CO-ORDINATES OF POINTS ON DOWNSTREAM CLOSURE
C
C
C     STRAIGHT SECTION BETWEEN HUB AND SHROUD OR SPLITTER
C
C
      IF (NBDY1.EQ.0) GO TO 230
      YNBDY1=YON(NBDY1)
      Y4SAVE=YON(NBDY1)
      Y5SAVE=YON(NBDY1+1)
      Y6SAVE=YON(NBODY2)
      Y7SAVE=YON(NBODY2+1)
      GO TO 235
  230 YNBDY1=0.0
      Y4SAVE=0.0
  235 NDY4=(YON(NBDY1+1)-YNBDY1)*1.5/DELSMX
      ENDY4=NDY4
      NPTS=NDY4+1
      NBDPTS(NBDYS+1)=NPTS+NBDPTS(NBDYS)
      DY4=(YON(NBDY1+1)-YNBDY1)/ENDY4
      DO 240 I=1,NPTS
      AYEM=I-1
      IPN=I+K
      XON(IPN)=XON(NBDY1+1)
      YON(IPN)=YNBDY1+AYEM*DY4
  240 CONTINUE
  245 ITOPT4=K+I
      ITOPT5=ITOPT4+NDY4
      IF (NBDYS.LE.2) GO TO 255
C
C
C     STRAIGHT SECTION BETWEEN FLOW SPLITTER AND SHROUD
C
C
      YNBDY2=Y6SAVE
      NDY5=(Y7SAVE-Y6SAVE)*1.5/DELSMX
      ENDY5=NDY5
      NPTS=NDY5+1
      NBDPTS(NBDYS+2)=NPTS+NBDPTS(NBDYS+1)
      DY5=(Y7SAVE-Y6SAVE)/ENDY5
      DO 250 I=1,NPTS
      AYEM=I-1
      IPN=I+ITOPT5
      XON(IPN)=XON(NBODY2+1)
      YON(IPN)=YNBDY2+AYEM*DY5
```

```
  250 CONTINUE
      ITOPT6=ITOPT5+1
      ITOPT7=ITOPT6+NDY5
C
C           CALL SUBROUTINE TO WRITE AND PUNCH CARDS
C
  255 CALL WPUNCH
      IF (NBDYS.GT.2) GO TO 260
      NT1=ITOPT5-3
      NT2=K-2
      GO TO 265
  260 NT1=ITOPT7-5
      NT2=ITOPT5-4
      NT3=K-3
      NSPLMX=NBODY2-2
  265 NHUBMX=NBDY1-1
      NP=0
      DO 270 I=1,NRAKES
      NP=NP+NDY(I)+1
  270 CONTINUE
      NHBMXD=NHUBMX
      IF (NBDYS.LE.2) GO TO 275
      WRITE (6,565)NT1,NT2,NT3,NHUBMX,NSPLMX,NP
      GO TO 285
  275 IF (NHUBMX.GT.0) GO TO 280
      NHUBMX=NHUBMX+1
      NT1=NT1+1
      NT2=NT2+1
  280 WRITE (6,540)NT1,NT2,NHUBMX,NP
C
C     CALCULATING HUB SURFACE DISTANCE (S-S(2))
C
  285 CALL SINTP (XON,SON,NBDY1,XR1,S2)
      WRITE (6,505)
      IF (IFLAG.EQ.1) GO TO 295
      SDEL=0.0
      DO 290 I=1,NBDY1
      IF (I.NE.1) SDEL=SON(I)-SON(I-1)
      SO(I)=SON(I)-S2
  290 WRITE (6,520)I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),SO(
     1I),SDEL
C
C     CALCULATION SHROUD OR LOWER FLOW SPLITTER SURFACE DISTANCE
C
  295 NBP1=NBDY1+1
      IF (NBDYS.EQ.1) NBODY2=ITOP12
      DO 300 I=NBP1,NBODY2
      JJ=I
      IF (XON(I).LT.XON(I+1)) GO TO 305
  300 CONTINUE
  305 CALL SINTP (XON(NBP1),SON(NBP1),JJ-NBDY1,XR1,S22)
      IF (IFLAG.EQ.1) GO TO 310
      WRITE (6,510)
  310 IF (NBDYS.LE.2) JJ=NBODY2
      SDEL=0.0
      DO 315 I=NBP1,JJ
      IF (I.NE.NBP1) SDEL=SON(I)-SON(I-1)
```

```
      S(I)=S22-SON(I)
  315 WRITE (6,520)I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),S(I
     1),SDEL
      IF (NBDYS.LE.2) GO TO 340
C
C      CALCULATING FLOW SPLITTER UPPER SURFACE DISTANCE
C
      JJ=JJ+1
      WRITE (6,530)
      CALL SINTP (XON(JJ),SON(JJ),NBODY2-JJ,XRI,S23)
      SDEL=0.0
      DO 320 I=JJ,NBODY2
      IF (I.NE.JJ) SDEL=SON(I)-SON(I-1)
      S(I)=SON(I)-S23
  320 WRITE (6,520)I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),S(I
     1),SDEL
C
C     CALCULATING SHROUD SURFACE DISTANCE (IF THERE IS A FLOW SPLITTER)
C
      NBP1=NBODY2+1
      DO 325 I=NBP1,ITOP12
      JJ=I
      IF (XON(I).LT.XON(I+1)) GO TO 330
  325 CONTINUE
  330 CALL SINTP (XON(NBP1),SON(NBP1),JJ-NBODY2,XRI,S33)
      WRITE (6,535)
      SDEL=0.0
      DO 335 I=NBP1,ITOP12
      IF (I.NE.NBP1) SDEL=SON(I)-SON(I-1)
      S(I)=S33-SON(I)
  335 WRITE (6,520)I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),S(I
     1),SDEL
C
  340 NBDSV=NBDYS
      IF (NNSD.EQ.0) GO TO 350
      NS=1
  345 IBD=NBDYS+NS
      INSD=I+NSDBDY(NS)
      IBNSD=I+1
      WRITE (6,610)IBD
      WRITE (6,615)(I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),I=
     1IBNSD,INSD)
      NS=NS+1
      IF (NS.LE.NNSD) GO TO 345
      NBDYS=IBD
C
C     WRITE OUT CLOSURE COORDINATES
C
  350 IBD=NBDYS+1
      WRITE (6,515)IBD,(I,XON(I),YON(I),I=ITOPT4,ITOPT5)
      IF (NBDSV.NE.3) GO TO 355
      IBD=IBD+1
      WRITE (6,515)IBD,(I,XON(I),YON(I),I=ITOPT6,ITOPT7)
  355 WRITE (6,545)(XRAK(I),YLO(I),YHI(I),NY(I),I=1,NRAKES)
      CALL AREAA
C
C(((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((
```

```
C
C((((((          CURVATURE PLOTS      ((((((((((((((((((((((((((((((((((((
C
      LFL=6
C(((((( IF IPLOTC IS NOT ZERO,  PLOT THE CURVATURE VS. S(IF IPLOTC .GT.0)
C((((((                                       OR VS.X (IF IPLOTC .LT.0)
      IF (IPLOTC.EQ.0) GO TO 405
      IF(IPLOTC.LT.0) LFL=4
      LE=0
C(((((( LEA = LAST PT. ON SHROUD
      LEA=ITOPT4-1
      LL=1
C(((((( TEST EACH SHROUD PT. FOR     1) IN RANGE OF X-AXIS
C((((((                              2) BEFORE OR AFTER HIGHLIGHT
C((((((                              3) FINITE CURVATURE
  360 LEE=LL+NBDPTS(1)
      IF (XON(LEE).GT.(XX*EXEP+XMIN)) GO TO 375
      IF (XON(LEE).LT.XON(LEE+1).AND.LEE.LT.LEEHI) GO TO 365
      IF (CAPPA(LEE).EQ.99999.) GO TO 375
      LE=LE+1
      DIST(LE)= SON(LEE)
      CAPPER(LE)= CAPPA(LEE)
C(((((( FLAG THE HIGHLIGHT
      IF (XON(LEE).GT.XON(LEE+1)) GO TO 370
  365 IF(LEE.LT.LEEHI) LEEHI=LEE
C(((((( USE ABSOLUTE VALUE OF CURVATURE ON EXTERIOR OF SHROUD
      IF(CAPPER(LE).LT.0.) CAPPER(LE)=-CAPPER(LE)
  370 IF(IPLOTC.LT.0) DIST(LE)=XON(LEE)
C(((((( IF CURVAT.-VS.-X PLOT IS NEEDED AND HIGHLIGHT HAS BEEN REACHED,
C(((((( PLOT THE FIRST FRAME (INTERNAL SHROUD PTS.)
      IF (IPLOTC.LT.0.AND.LEE.EQ.LEEHI) GO TO 380
  375 LL=LL+1
      IF (LL.LE.(ITOPT4-1-NBDPTS(1))) GO TO 360
  380 CALL PLOT(XX,0.,-3)
C(((((( IF THE SECOND X-CURVE (EXTERNAL PTS.) IS BEING PLOTTED, DO NOT
C(((((( GENERATE NEW SCALE FACTORS. USE THOSE OF THE INTERNAL PLOT.
      IF (LEE.GT.LEEHI.AND.IPLOTC.LT.0) GO TO 385
      CALL CSCALE(CAPPER,YY,LE,1,10,EXMIN,DEEX)
  385 CAPPER(LE+1)=EXMIN
      CAPPER(LE+2)=DEEX
      IF (LEE.GT.LEEHI.AND.IPLOTC.LT.0) GO TO 390
      CALL CSCALE(DIST ,YY,LE,1,10,EXMIND,DEEXD)
  390 DIST(LE+1)=EXMIND
      DIST(LE+2)=DEEXD
      IF(IPLOTC.LT.0) DIST(LE+1)= XMIN
      IF(IPLOTC.LT.0) DIST(LE+2)= EXEP
C((((((     DRAW AXES FOR CURVATURE PLOT
      CALL PLOXIS(XX,YY,DIST(LE+2),CAPPER(LE+2),DIST(LE+1),CAPPER(LE+1),
     1.25,.25,0,0,LFL,5,1,2)
      CALL LINE(DIST,CAPPER,LE,1,1,3,DIST(LE+1),DIST(LE+2),CAPPER(LE+1),
     1CAPPER(LE+2))
C((((((     DRAW SEGMENT MARKERS
      DO 400 MEM=1,MM
      IF(IPLOTC.LT.0) BAGS(MEM)=BAGX(MEM)
      IF(ZAP(MEM).LT.0..AND.NZAP(MEM).GT.LEEHI) ZAP(MEM)=-ZAP(MEM)
      IF(ZAP(MEM).EQ.99999.) ZAP(MEM)=YY*CAPPER(LE+2) + CAPPER(LE+1)
      IF (LEE.GT.LEEHI.AND.IPLOTC.LT.0) GO TO 395
```

```
      BAGS(MEM)=(BAGS(MEM)-DIST(LE+1))/DIST(LE+2)
      ZAP(MEM)=(ZAP(MEM)-CAPPER(LE+1)) /CAPPER(LE+2)
      IF(IPLOTC.GT.0.AND. NZAP(MEM).LT.LEEHI) CALL SYMBOL(BAGS(MEM),ZAP(
     1MEM),.2,1,0.,-1)
  395 IF (IPLOTC.LT.0.AND.BAGS(MEM).GT.(XX*EXEP+XMIN)) GO TO 400
      IF((NZAP(MEM).LE.LEEHI.AND.LEE.EQ.LEEHI).OR.(NZAP(MEM).GE.LEEHI.AN
     1D.LEE.NE.LEEHI)) CALL SYMBOL(BAGS(MEM),ZAP(MEM),.2,1,0.,-1)
  400 CONTINUE
      IF (LL.GT.(ITOPT4-1-NBDPTS(1)).OR.LEE.GT.LEEHI.OR.XON(LEE).EQ.XON(
     1LEA)) GO TO 405
      LE=0
      CALL SYMBOL(XX-.5,YY-.5,.3,52,0.,-1)
      GO TO 375
C
C((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((
C
C(((((( ADVANCE THE PLOT ORIGIN FOR THE NEXT CASE
  405 CALL PLOT(XX,0.,-3)
C((((( IF THE CASE IS NOT TO BE REWORKED VIA FESSLER, BEGIN NEXT JOB
      IF (IAB.LE.0) GO TO 410
      REWIND 4
      NIN=4
      DELS =DSAVE
      GO TO 20
  410 IF (IREDON(1).EQ.0) GO TO 10
      REWIND 4
      LPNCHO= IREDON(2)
      IPLOTA= IREDON(3)
      IPLOTC= IREDON(4)
      IREAD = IREDON(5)
      IREDON(1)=  IREDON(1)- 1
C(((((( WRITE THE ORIGINAL CASE OUTPUT ON UNIT 4 FOR ACCEPTANCE AS INPUT
C   BY DIRECT INTERPOLATION OPTION(XYCALC,FESSLER)
      WRITE (4,475)IDENT,PROG,N06,LPNCHO,IPLOTA,IPLOTC,IAB,(IREDON(I),I=
     21,4)
      DO 425 I=1,NBDYS
      IF(NBDYS.EQ.2.AND.I.EQ.2) TYP(I)=2.
      IF (I.EQ.1) GO TO 415
      KA= KAY(I-1)+2
      GO TO 420
  415 KA=2
  420 WRITE (4,440)TYP(I)
      KB= KAY(I)-1
      KAB=KA-1
      WRITE (4,445)XON(KAB),YON(KAB)
      WRITE (4,450)(XON(J),YON(J),J=KA,KB)
      KC=KAY(I)
      WRITE (4,455)XON(KC),YON(KC)
  425 CONTINUE
      IF (NNSD.EQ.0) GO TO 435
      WRITE (4,460)DELSND
      NTOT=0
      DO 430 N=1,NNSD
      NKA1=KAY(NBDYS)+ NTOT +1
      NTOT= NTOT+ NSDBDY(N)
      WRITE (4,465)XON(NKA1),YON(NKA1)
      NA =NKA1+1
```

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      NB =NKA1+ NSBODY(N)   -2
      WRITE (4,450)(XON(J),YON(J),J=NA,NB)
      NC =NB+1
      WRITE (4,455)XON(NC),YON(NC)
  430 CONTINUE
  435 NIN=4
      REWIND 4
      GO TO 20
  440 FORMAT(F10.2,10H    0.      )
  445 FORMAT(1X,11H$BODYIN Z=(,F10.6,1H,,F10.6,4H),   )
  450 FORMAT(12X,1H(,F10.6,1H,,F10.6,3H), )
  455 FORMAT(12X,1H(,F10.6,1H,,F10.6,3H) $/1X,20H$AUXIN DONE=.TRUE. $)
  460 FORMAT(8F10.2)
  465 FORMAT(3X,7H-1      /1X,11H$BODYIN Z=(,F10.6,1H,,F10.6,4H),   )
  470 FORMAT(1H+,13X,6HREDONE)
  475 FORMAT(          2A6,I4,2I1, I2,12X,I1,9X,3I1, I2)
C
C     FORMATS
C
C
  480 FORMAT (1H0,10X,16HNO. OF BODIES = ,F2.0,5X,7HDELS = ,F6.3,5X,9HDE
     1LSMX = ,F6.3,5X,6HXRI = ,F10.6)
  485 FORMAT (20I4)
  490 FORMAT(          2A6,I4,2I1,2I2,10X,I1,9X,3I1,2I2)
  495 FORMAT(          2A6,I4,2I1, I2,12X,1H0,9X,3I1, I2)
  500 FORMAT (9A6)
  505 FORMAT (1X/1X23HBODY 1 CO-ORDINATES - X12X1HY10X5HKAPPA10X5HDY/DX1
     10X5HALPHA5X1HS8X6HS-S(2),8X,6HDELTAS/1X)
  510 FORMAT (1X/1X23HBODY 2 CO-ORDINATES - X12X1HY10X5HKAPPA10X5HDY/DX1
     10X5HALPHA5X1HS,8X,7HS*(2)-S,8X,6HDELTAS/1X)
  515 FORMAT (1X/1X5HBODY I1,17H CO-ORDINATES - X12X1HY/1X/(9XI4,3XE12.5
     1,E13.5))
  520 FORMAT (9XI4,3XE12.5,7E13.5)
  525 FORMAT (6H1CASE A6,10X,9A6/1X)
  530 FORMAT (1H0)
  535 FORMAT (1X/1X,23HBODY 3 CO-ORDINATES - X,12X,1HY,10X,5HKAPPA,10X,5
     1HDY/DX,10X,5HALPHA,5X,1HS,8X,6HS-S(3),8X,6HDELTAS/1X)
  540 FORMAT (/10X,30H INPUT FOR THE COMBINE PROGRAM,7H NT(1)=,I4,7H NT(
     12)=,I4,8H NHUBMX=,I4,4H NP=,I4/)
  545 FORMAT (1X,4HXRAK,10X,3HYLO,11X,3HYHI,16X,3HNDY//,(3E14.5,5X,I3))
  550 FORMAT (3F8.5,I3)
  555 FORMAT (8F10.2)
  560 FORMAT( F10.2,10F7.4/F7.5,F7.2)
  565 FORMAT (/5X,30H INPUT FOR THE COMBINE PROGRAM,7H NT(1)=,I4,7H NT(2
     1)=,I4,7H NT(3)=,I4,8H NHUBMX=,I4,8H NSPLMX=,I4,4H NP=,I4/)
  570 FORMAT (1H0,10X,6HENREED,10X,13HSTRAIGHT LINE/11X,F6.3,5X,1HX,1P2E
     115.4/22X,1HY,1P2E15.4)
  575 FORMAT(1H0,7X,9HEXPONENTS,10X,12HSUPERELLIPSE/7X,4HP = ,F6.3,5X,1H
     1X,1P6E15.4/7X,4HQ = ,0PF6.3,5X,1HY,1P6E15.4)
  580 FORMAT (1H0,10X,6HENREED,10X,10HLEMNISCATE/11X,F6.3,5X,1HX,1P3E15.
     14/22X,1HY,1P3E15.4)
  585 FORMAT (1H0,10X,6HENREED,10X,7HELLIPSE/11X,F6.3,5X,1HX,1P4E15.4/22
     1X,1HY,1P4E15.4)
  590 FORMAT (1H0,2X,18H**** HUB *********)
  595 FORMAT (1H0,2X,18H**** SHROUD ******)
  600 FORMAT (1H0,2X,18H**** SPLITTER ****)
  605 FORMAT (1H0,10X,6HENREED,10X,5HCUBIC/11X,F6.3,5X,1HX,1P4E15.4/22X,
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```
     1HY,1P4E15.4)
610 FORMAT (1X/1X,5HBODY,I2,17H CO-ORDINATES - X,12X,1HY,10X,5HKAPPA,1
     10X,5HDY/DX,10X,5HALPHA,5X,1HS,8X,6HS-S(2),8X,6HDELTAS/1X)
615 FORMAT (9X,I4,3X,F12.5,5E13.5)
620 FORMAT(2F10.7)
625 FORMAT(6F12.5)
630 CALL PLOT(3.,0.,-3)
    CALL PLOTID
    STOP
    END
```

```
      SUBROUTINE AREAA
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /MNSD/ NNSD,NSDBDY(10)
      COMMON/ LOT/XMIN,YMIN,ORD,EXEP,XX,YY,LPNCHO,IPLOTA,MM
      DIMENSION JMAX(20), JMIN(20),                   AREAS(20), YAR(20)
     1,XXA(200),           DISC(200),ANULUS(200)
      PI=3.14159265
      JPLA=0
      NBP1=NBDY1+1
      DO 10 J=NBP1,NBODY2
      JJ=J
C((((((  .LT. CHANGED TO LE. TO AVOID AREA PLOTS FROM GOING UP VSTOL LIP
      IF (XON(J).LE.XON(J+1)) GO TO 15
   10 CONTINUE
   15 WRITE (6,75)
      IF (NNSD.EQ.0) GO TO 40
C
C     SEARCH FOR MINIMUM AND MAXIMUM X ON EACH NSD (SPLITTER)
C
      NB=NBODY2+1
      NE=NBODY2+NSDBDY(1)
      DO 35 I=1,NNSD
      XMIN=XON(NB)
      JMIN(I)=NB
      XMAX=XON(NB)
      JMAX(I)=NB
      NEM1=NE-1
      DO 30 J=NB,NEM1
      IF (XON(J).GT.XMAX) GO TO 20
      IF (XON(J).LT.XMIN) GO TO 25
      GO TO 30
   20 XMAX=XON(J)
      JMAX(I)=J
      GO TO 30
   25 XMIN=XON(J)
      JMIN(I)=J
   30 CONTINUE
      NB=NE+1
      NE=NE+NSDBDY(I+1)
      WRITE (6,80)XMIN,XMAX,JMIN(I),JMAX(I)
   35 CONTINUE
   40 DO 65 J=NBP1,JJ
      IA=1
      CALL SINTP (XON,YON,NBDY1,XON(J),YAR(IA))
      IF (NNSD.EQ.0) GO TO 50
      JEND=NBODY2
      DO 45 I=1,NNSD
      JMI=JMIN(I)
      JMA=JMAX(I)
      JEND=NSDBDY(I)+JEND
      IF (XON(J).GT.XON(JMA).OR.XON(J).LT.XON(JMI)) GO TO 45
      IA=IA+1
      CALL SINTP (XON(JMA),YON(JMA),JMI-JMA+1,XON(J),YAR(IA))
      IA=IA+1
```

```
      CALL SINTP (XON(JMI),YON(JMI),JEND-JMI+1,XON(J),YAR(IA))
   45 CONTINUE
   50 IA=IA+1
      YAR(IA)=YON(J)
      IS=0
      AREA=0.0
      DO 55 I=1,IA,2
      IS=IS+1
      AREAS(IS)=(YAR(I+1)**2-YAR(I)**2)*PI
      AREA=AREA+AREAS(IS)
   55 CONTINUE
      AREAD=AREA+YAR(1)**2*PI
      ENSUBK=CAPPA(J)*(YON(J)-YAR(1))/SQRT(1.+YAR(1)/YON(J))
      IF(CAPPA(J).GT.90000.)ENSUBK=99999.
      IF (NNSD.EQ.0) GO TO 60
      WRITE (6,85)(AREAS(I),I=1,IS)
   60 WRITE (6,90)J,XON(J),YON(J),YAR(1),AREA,AREAD,ENSUBK
      WRITE (6,95)
      IF (XON(J).GT.(XX*EXEP+XMIN)) GO TO 65
      JPLA=JPLA+1
      XXA(JPLA)=XON(J)
      ANULUS(JPLA)=AREA
      DISC(JPLA)=AREAD
   65 CONTINUE
C((((((   IF AREA PLOT IS NOT REQUIRED, GO TO 25
      IF (IPLOTA.LE.0) GO TO 70
      CALL CSCALE(DISC,YY,JPLA,1,10,EXMIN,DEEX)
      CALL CSCALE(ANULUS,YY,JPLA,1,10,EXMIN,DEEX)
      DISC(JPLA+1)=EXMIN
      DISC(JPLA+ 2)=DEEX
      CALL PLOT(XX,0.,-3)
      CALL PLOXIS(XX,YY,EXEP,DISC(JPLA+2),XMIN,DISC(JPLA+1),.25,.25,0,0,
     14,3,0,0)
C((((((  PLOT THE DISC AREA VS. X
      CALL LINE(XXA,DISC,JPLA,1,1,3,XMIN,EXEP,DISC(JPLA+1),DISC(JPLA+2))
C((((((  PLOT  THE ANNULUS AREA VS. X
      CALL LINE(XXA,ANULUS,JPLA,1,1,3,XMIN,EXEP,DISC(JPLA+1),DISC(JPLA+2
     1))
   70 RETURN
C
   75 FORMAT (1H1//9X,1HI,14X,3HXON,18X,3HYON,16X,4HYONH,12X,4HAREA,14X,
     19HDISC AREA,10X,6HENSUBK)
   80 FORMAT (1H0,5X,7HXMIN = ,1PE14.5,5X,7HXMAX = ,1PE14.5,5X,7HJMIN = 
     1,I6,5X,7HJMAX = ,I6)
   85 FORMAT (74X,1PE19.4)
   90 FORMAT (8X,I3,1P6E19.4)
   95 FORMAT (1H0)
      END
```

```
      SUBROUTINE CUBIC (K)
C
C     FIT A CUBIC BETWEEN 2 STRAIGHT LINES -- RESTRICTION -- THE STRAIGH
C                   LINES CANNOT BE VERTICAL
C
      DIMENSION AA(4,4), BB(4)
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      DELSIN=DELS1
      DELS=DELS1
      KOUNT=0
      K=K-1
      KSTART=K
      X2=XIN(2)
      X3=XIN(3)
      Y2=YIN(2)
      Y3=YIN(3)
      SLOP2=(YIN(4)-Y3)/(XIN(4)-X3)
C
C     SETUP  4  X  4   MATRIX OF COEFFICIENTS
C
      AA(1,1)=1.0
      AA(1,2)=X2
      AA(1,3)=X2*X2
      AA(1,4)=X2**3
      AA(2,1)=0.0
      AA(2,2)=1.0
      AA(2,3)=2.0*X2
      AA(2,4)=3.0*X2**2
      AA(3,1)=1.0
      AA(3,2)=X3
      AA(3,3)=X3**2
      AA(3,4)=X3**3
      AA(4,1)=0.0
      AA(4,2)=1.0
      AA(4,3)=2.0*X3
      AA(4,4)=3.0*X3**2
      DO 10 II=1,4
   10 CONTINUE
C
C     SETUP VECTOR OF ORIGINAL CONSTANTS -- BB
C
      BB(1)=Y2
      BB(2)=(Y2-YIN(1))/(X2-XIN(1))
      BB(3)=Y3
      BB(4)=(YIN(4)-Y3)/(XIN(4)-X3)
      NSIM=4
      KSIM=0
      CALL SIMQ (AA,BB,NSIM,KSIM)
      D=BB(1)
      C=BB(2)
      A=BB(4)
      C=BB(2)
      B=BB(3)
```

```
 15 K=KSTART
    KOUNT=KOUNT+1
    XON(K+1)=XIN(2)
    YON(K+1)=YIN(2)
    DYDXO(K+1)=3.0*A*XON(K+1)**2+2.0*B*XON(K+1)+C
    CAPPA(K+1)=(6.0*A*XON(K+1)+2.0*B)/((1.0+DYDXO(K+1)**2)**1.5)
    ALPHA(K+1)=ATAN(DYDXO(K+1))
    DS=DELS/(1.0+.2*TANH(ABS(CAPPA(K+1))))
 20 K=K+1
    DXKP1=DS/(SQRT(1.0+DYDXO(K)))
    IF (XIN(3).LT.XIN(2)) DXKP1=-DXKP1
    XON(K+1)=XON(K)+DXKP1
    YON(K+1)=A*XON(K+1)**3+B*XON(K+1)**2+C*XON(K+1)+D
    DYDXO(K+1)=3.0*A*XON(K+1)**2+2.0*B*XON(K+1)+C
    CAPPA(K+1)=(6.0*A*XON(K+1)+2.0*B)/((1.0+DYDXO(K+1)**2)**1.5)
    DS=DELS/(1.0+.2*TANH(ABS(CAPPA(K+1))))
    ALPHA(K+1)=ATAN(DYDXO(K+1))
    SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
    IF (SLOP2.GT.1.0) GO TO 25
    IF (XIN(4).GE.X3.AND.XON(K+1).GT.X3) GO TO 30
    IF (XIN(4).LT.X3.AND.XON(K+1).LE.X3) GO TO 30
    GO TO 20
 25 IF (YIN(4).GE.Y3.AND.YON(K+1).GT.Y3) GO TO 30
    IF (YIN(4).LT.Y3.AND.YON(K+1).LE.Y3) GO TO 30
    GO TO 20
 30 IF (KOUNT.GT.100) GO TO 55
    DELSS=DELS
    DSTEST=((XON(K+1)-XIN(3))**2+(YON(K+1)-YIN(3))**2)**.5
    IF (ABS(DS-DSTEST).LT..01*DS) GO TO 35
    IF (DSTEST.LT..01*DS) GO TO 40
    IF (DSTEST-.5*DS) 50,45,45
 35 K=K-1
 40 XON(K+1)=XIN(3)
    YON(K+1)=YIN(3)
    GO TO 55
 45 DELS=DELS+(DS-DSTEST)/FLOAT(K-1-KSTART)
    IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
    GO TO 15
 50 DELS=DELS-DSTEST/FLOAT(K-KSTART)
    IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
    GO TO 15
 55 DELS1=DS*1.2
    IF (DELS1.GT.DELS) DELS1=DELS
    WRITE (6,65)KOUNT,A,B,C,D
    WRITE (6,70)DELSIN,DELS,DELS1,DSTEST
    KEND=K+1
    KSTART=KSTART+1
    DO 60 I=KSTART,KEND
    ALPHA(I)=ALPHA(I)/PIO180
 60 CONTINUE
    RETURN
C
C
 65 FORMAT (1H0,2X,I4,2X,10HITERATIONS,2X,4HA = ,1PE12.5,2X,4HB = ,1PE
   112.5,2X,4HC = ,1PE12.5,2X,4HD = ,1PE12.5)
 70 FORMAT (3X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = ,
   1F8.5,3X,9HDSTEST = ,F8.5)
```

114. END J 1130

```
SO.NTRPDC                                                                        07 OCT 76  14
      SUBROUTINE DNTRPC                                                          R    0000
C.....CALCULATION OF C COEFFICIENTS FOR DERIVATIVES OF DOUBLE                    R    0010
C.....3-POINT INTERPOLATION.                                                     R    0020
      COMMON /NTRPC1/ L,I,A11,A12,A13,A14,A22,A23,A24,A33,A34,A44                R    0030
      COMMON /NTRPC3/ I1,I2,C1,C2,C3,C4                                          R    0040
      IF (L.LE.1) GO TO 25                                                       R    0050
      IF (L-3) 20,15,10                                                          R    0060
C.....FOR DOUBLE 3-POINT INTERPOLATION.                                          R    0070
   10 C1=+(A22+A33+A22)/A23*A33/A12/A13                                          R    0080
      C4=-(A33+A22+A33)/A23*A22/A34/A24                                          R    0090
      P=A23*A23                                                                  R    0100
      C2=-((A11+A33+A11)*A33/A12+(A33*A44+A22*A44+A22*A33)/A24)/P                R    0110
      C3=+((A44+A22+A44)*A22/A34+(A22*A11+A33*A11+A33*A22)/A13)/P                R    0120
      GO TO 30                                                                   R    0130
C.....FOR SIMPLE 3-POINT INTERPOLATION.                                          R    0140
   15 C1=+(A33+A22)/A12/A13                                                      R    0150
      C2=-(A33+A11)/A12/A23                                                      R    0160
      C3=+(A22+A11)/A13/A23                                                      R    0170
      GO TO 30                                                                   R    0180
C.....FOR 2-POINT INTERPOLATION.                                                 R    0190
   20 C1=1.0/A12                                                                 R    0200
      C2=-C1                                                                     R    0210
      GO TO 30                                                                   R    0220
C.....ONLY ONE TABLE VALUE GIVEN.                                                R    0230
   25 C1=0.0                                                                     R    0240
   30 I1=I                                                                       R    0250
      I2=I+L-1                                                                   R    0260
      RETURN                                                                     R    0270
      END                                                                        R    0280
```

```
      SUBROUTINE DRAW(KR,KK )                                           Z2  0000
C(((((( SUBROUTINE ADDED TO DRAW PICTURE OF INLET VIA CALCOMP PLOTTER.  Z2  0010
C(((((( CALLED ONCE FOR EACH SEGMENT                                    Z2  0020
C                                                                       Z2  0030
      DIMENSION X(200),Y(200)                                           Z2  0040
        COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS                           Z2  0050
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500Z2  0060
     1),ALPHA(500),CAPPA(500),SON(500),PI0180                           Z2  0070
      COMMON/ LOT/XMIN,YMIN,ORD,EXEP,XX,YY,LPNCHO,IPLOTA,MM             Z2  0080
      COMMON/TOL/BAGS(15),BAGX(15),ZAP(15),NZAP(15)                     Z2  0090
      KL=KR+1                                                           Z2  0100
      II=0                                                              Z2  0110
      DO 20 I=1,KL                                                      Z2  0120
      N=KK+I-1                                                          Z2  0130
      IF (II.GE.200.OR.N.GT.500) GO TO 30                               Z2  0140
C((((((   TEST EACH (X,Y) PT. EXCLUDE THOSE BEYOND (XX*EXEP+XMIN) INCHESZ2  0150
      IF (XON(N)-XX*EXEP-XMIN) 10,10,20                                 Z2  0160
   10 IF (YON(N)-YY*ORD-YMIN) 15,15,20                                  Z2  0170
   15 II=II+1                                                           Z2  0180
      X(II)=XON(N)                                                      Z2  0190
      Y(II)=YON(N)                                                      Z2  0200
      IF (II.NE.1.OR.TYPBDY.EQ.1.) GO TO 20                             Z2  0210
C((((((  STORE CURVATURE VALUES OF SEGMENT'S FIRST PT. FOR USE WITH     Z2  0220
C SUBSEQUENT CURVATURE PLOTS.                                           Z2  0230
      MM=MM+1                                                           Z2  0240
      BAGX(MM)=XON(N)                                                   Z2  0250
      BAGS(MM)=SON(N)                                                   Z2  0260
      ZAP(MM)=CAPPA(N)                                                  Z2  0270
      NZAP(MM)=N                                                        Z2  0280
   20 CONTINUE                                                          Z2  0290
C((((((  DRAW A SEGMENT MARKER AT FIRST PT. OF SEGMENT                  Z2  0300
      IF (XON(KK).GT.(XX*EXEP+XMIN).OR.YON(KK).GT.(YY*ORD+YMIN)) GO TO 2Z2  0310
     *5                                                                 Z2  0320
      XSYM= (X(1)-XMIN)/EXEP                                            Z2  0330
      YSYM=(Y(1)-YMIN)/ORD                                              Z2  0340
      CALL SYMBOL(XSYM,YSYM,.2,1,0.,-1)                                 Z2  0350
   25 CALL LINE(X,Y,II,1,1,3,XMIN,EXEP,YMIN,ORD)                        Z2  0360
      RETURN                                                            Z2  0370
   30 WRITE (6,35)II,N                                                  Z2  0380
   35 FORMAT(1H0,' SCIRCLE ERROR EXIT - DATA POINTS EXCEED 200 ON A SEG Z2  0390
     1OR EXCEED 500 ON TOTAL INLET - ' /2I8)                            Z2  0400
      STOP                                                              Z2  0410
      END                                                               Z2  0420
```

```
      COMPLEX FUNCTION DZTRP (A,F,X,NA)
C.....COMPLEX DERIVATIVE EVALUATION FOR DOUBLE 3-POINT INTERPOLATION.
      COMPLEX F(NA)
      COMMON /NTRPCZ/ I1,I2,C(4)
C.....FIRST EVALUATE FUNCTION COEFFICIENTS.
      CALL FNTRPA (A,X,NA)
      CALL DNTRPC
C.....THEN EVALUATE FUNCTION VALUE.
      DZTRP=0.0
      J=0
      DO 10 I=I1,I2
      J=J+1
   10 DZTRP=DZTRP+C(J)*F(I)
      RETURN
      END
```

```
      SUBROUTINE ELLIPSE (K)
C
C     THIS SUBROUTINE FITS A SEGMENT OF AN ELLIPSE TO TWO ARBITRARILY
C              ORIENTED STRAIGHT LINES NOT MORE THAN 90 DEGREES APART
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
C
C     TRANSLATE INPUT BREAK POINTS SO THAT POINT NO. 2 BECOMES
C        THE ORIGIN
C
      DELSIN=DELS1
      KOUNT=0
      DELS=DELS1
      PI=3.141592653
      K=K-1
      KSTART=K
      X2=XIN(2)
      Y2=YIN(2)
      DO 10 I=1,4
      XIN(I)=XIN(I)-X2
   10 YIN(I)=YIN(I)-Y2
C
C     ROTATE THE TRANSLATED BREAK POINTS SO THAT THE SLOPE OF THE
C        FIRST STRAIGHT LINE IS ZERO
C
      IF (XIN(2).NE.XIN(1)) GO TO 15
      SLOPE=99999.
      PHI=-PIO2
      IF (YIN(1).GT.YIN(2)) PHI=PIO2
      GO TO 20
   15 SLOPE=(YIN(2)-YIN(1))/(XIN(2)-XIN(1))
      PHI=ATAN(SLOPE)
      IF (XIN(1).LT.XIN(2)) PHI=PI+ATAN(SLOPE)
   20 DO 25 I=1,4
      XA=XIN(I)
      XIN(I)=XA*COS(PHI)+YIN(I)*SIN(PHI)
   25 YIN(I)=-XA*SIN(PHI)+YIN(I)*COS(PHI)
C
C     DETERMINE THE ELLIPSE
C
      IF (XIN(4).NE.XIN(3)) GO TO 30
      B=YIN(3)
      A=ABS(XIN(3))
      PHIAB=PIO2
      GO TO 35
   30 SLOP2=(YIN(4)-YIN(3))/(XIN(4)-XIN(3))
      IF (SLOP2.LE.2.0*YIN(3)/XIN(3)) GO TO 135
      C3=XIN(3)*SLOP2/YIN(3)
      PHIAB=2.0*ATAN(SQRT((C3-2.0)/C3))
      A=-XIN(3)/SIN(PHIAB)
      B=YIN(3)/(1.0-COS(PHIAB))
   35 THETMX=PHIAB-PIO2
      THTMXD=THETMX/PIO180
```

```
      WRITE (6,140)A,B,XIN(1),YIN(1),PHI,THTMXO
C
C     INITIALIZE THE FIRST POINT ON THE ELLIPSE
C
   40 K=KSTART
      XON(K+1)=XIN(2)
      YON(K+1)=YIN(2)
      CAPPA(K+1)=-B/(A**2)
      ALPHA(K+1)=0.0
      DYDXO(K+1)=0.0
      KOUNT=KOUNT+1
      THET=-PIO2
      DSSAVE=DELS
      DS=DELS/(1.0+.2*TANH(ABS(CAPPA(I))))
      DTHET=DS/ABS(A)
      THET=THET+DTHET
C
C     GENERATE THE POINTS ON THE ELLIPSE
C
   45 K=K+1
   50 XON(K+1)=-A*COS(THET)
      YON(K+1)=B*(1.0+SIN(THET))
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      IF (ABS(SON(K+1)-SON(K)).GT.1.05*DS) GO TO 55
      IF (ABS(SON(K+1)-SON(K)).LT..95*DS) GO TO 60
      GO TO 65
   55 THET=THET-.02*DTHET
      GO TO 50
   60 THET=THET+.02*DTHET
      GO TO 50
   65 IF (THET.EQ.0.0) GO TO 70
      DYDXO(K+1)=B*COTAN(THET)/A
      ALPHA(K+1)=ATAN(DYDXO(K+1))
      GO TO 75
   70 DYDXO(K+1)=99999.
      ALPHA(K+1)=PIO2
   75 CAPPA(K+1)=-A*B/(B*B*COS(THET)**2+A*A*SIN(THET)**2)**1.5
      DS=DELS/(1.0+.2*TANH(ABS(CAPPA(I))))
      IF (ABS(DS-DELS).GT..20*DELS) DS=DELS+SIGN(.20*DELS,DS-DELS)
      DSSAVE=DS
   80 DTHET=DS/SQRT(B*B*COS(THET)**2+A*A*SIN(THET)**2)
      DTS=DTHET
      THET=THET+DTHET/2.0
      DTHET=DS/SQRT(B*B*COS(THET)**2+A*A*SIN(THET)**2)
      IF (ABS(DTHET-DTS).LT..001*DTS) GO TO 85
      GO TO 80
   85 IF (THET.LE.THETMX-DTHET/2.0) GO TO 45
      IF (KOUNT.GT.100) GO TO 115
      DELSS=DELS
      DSTEST=((XON(K+1)-XIN(3))**2+(YON(K+1)-YIN(3))**2)**.5
      IF (ABS(DS-DSTEST).LT..01*DS) GO TO 90
      IF (DSTEST.GT.DS) GO TO 110
      IF (DSTEST.LT..01*DS) GO TO 95
      IF (DSTEST-.5*DS) 105,90,100
   90 K=K+1
   95 XON(K+1)=XIN(3)
      YON(K+1)=YIN(3)
```

```
      GO TO 115
  100 DELS=(FLOAT(K+1-KSTART)*DELS+DSTEST)/FLOAT(K+2-KSTART)
      IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
      GO TO 40
  105 DELS=DELS+DSTEST/FLOAT(K+2-KSTART)
      IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
      GO TO 40
  110 DELS=.8*DELS
      GO TO 40
  115 DELS1=DS*1.2
      IF (DELS1.GT.DELS) DELS1=DELS
      WRITE (6,145)KOUNT
      WRITE (6,155)DELSIN,DELS,DELS1,DSTEST
      KEND=K+1
      KSTART=KSTART+1
C
C     ROTATE AND TRANSLATE BACK
C
      DO 130 KROT=KSTART,KEND
      XA=XON(KROT)
      XON(KROT)=XA*COS(PHI)-YON(KROT)*SIN(PHI)+X2
      YON(KROT)=XA*SIN(PHI)+YON(KROT)*COS(PHI)+Y2
      ALPHA(KROT)=ALPHA(KROT)+PHI
      IF (ALPHA(KROT).EQ.PI02) GO TO 120
      DYDXO(KROT)=TAN(ALPHA(KROT))
      GO TO 125
  120 DYDXO(KROT)=99999.
  125 ALPHA(KROT)=ALPHA(KROT)/PI0180
  130 CONTINUE
      RETURN
  135 WRITE (6,150)SLOP2,XIN(3),YIN(3)
      STOP
C
C
  140 FORMAT (1H0,10X,4HA  =,1PE10.3,5X,4HB = ,1PE10.3,5X,5HXO = ,1PE10.
     13,5X,7HYO   = ,1PE10.3/9X,7HPHI   = ,1PE10.3,5X,9HTHETMX = ,1PE10.3
     2)
  145 FORMAT (11X,I3,2X,13HITERATIONS---)
  150 FORMAT (1H0,10X,42HCOMBINATION OF SLOPE, X , Y NOT COMPATIBLE/5X,9
     1HSLOPE2 = ,F7.3,3X,9HXIN(3) = ,F7.3,3X,9HYIN(3) = ,F7.3)
  155 FORMAT (11X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = 
     1,F8.5,3X,9HDSTEST = ,F8.5)
      END
```

```
      SUBROUTINE FNSTRH (K)
C
C     FINAL STRAIGHT SEGMENT ON THE HUB AND SHROUD
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /FNST/ NFIRST
      NFIRST=K
      DS=DELS1
      DELSTR=DELSMX
      YTEST=YIN(2)-YIN(1)
      XTEST=XIN(2)-XIN(1)
      ASIGN=1.0
      IF (XTEST.LT.0.0) ASIGN=-1.0
      ISTAR=0
      SSEG=SQRT(XTEST**2+YTEST**2)
      IF (XTEST.EQ.0.0) GO TO 10
      IF (YTEST.EQ.0.0) GO TO 15
      DYDXC=YTEST/XTEST
      ALPHAC=ATAN(YTEST/XTEST)
      SINAL=SIN(ALPHAC)
      COSAL=COS(ALPHAC)
      GO TO 20
   10 DYDXC=SIGN(99999.,YTEST)
      ALPHAC=SIGN(PIO2,YTEST)
      SINAL=1.0
      COSAL=0.0
      GO TO 20
   15 DYDXC=0.0
      ALPHAC=0.0
      SINAL=0.0
      COSAL=1.0
   20 DYDXO(K+1)=DYDXC
      ALPHA(K+1)=ALPHAC
      IF (DS.GT.DELSMX) GO TO 25
      GO TO 45
   25 IF (ISTAR.NE.0) GO TO 45
      DSLAST=DS
      XON(K+1)=XON(K)
      YON(K+1)=YON(K)
      ICOUNT=0
   30 XSAVE=XON(K+1)-XIN(1)
      YSAVE=YON(K+1)-YIN(1)
      SSTAR=SQRT(XSAVE**2+YSAVE**2)
      ASTAR=(SSEG-SSTAR)/DELSTR
      ATEST=ASTAR-FLOAT(IFIX(ASTAR))
      IF (ATEST.GT..5) ASTAR=ASTAR+1.0
      NSTAR=IFIX(ASTAR)
      ISTAR=1
      IF (NSTAR.EQ.0) GO TO 35
      DS=(SSEG-SSTAR)/FLOAT(NSTAR)
      IF (DS.GT.DSLAST) GO TO 35
      IF (ICOUNT.GT.0) K=K+1
      GO TO 45
```

```
   35 K=K-1                                                         C     0560
      IF (K.GT.NFIRST) GO TO 40                                     C     0570
      K=NFIRST                                                      C     0580
      CALL STRAIT (K,0)                                             C     0590
      K=K-1                                                         C     0600
      GO TO 50                                                      C     0610
   40 DSLAST=SQRT((XON(K-1)-XON(K))**2+(YON(K-1)-YON(K))**2)*1.2    C     0620
      DELSTR=DSLAST                                                 C     0630
      ICOUNT=ICOUNT+1                                               C     0640
      GO TO 30                                                      C     0650
   45 XON(K+1)=XON(K)+ASIGN*DS*COSAL                                C     0660
      YON(K+1)=YON(K)+ASIGN*DS*SINAL                                C     0670
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)  C     0680
      CAPPA(K+1)=0.0                                                C     0690
      IF (ABS(XON(K+1)-XIN(2)).LE..001*DS.AND.XTEST.NE.0.0) GO TO 50  C     0700
      IF (ABS(YON(K+1)-YIN(2)).LE..001*DS.AND.XTEST.EQ.0.0) GO TO 50  C     0710
C                                                                   C     0720
C((((((   IS THE CURRENT POINT PAST THE NEAREST ENDPOINT OF SEGMENT  (PRC     0730
C((((((( VIOUS TESTS WERE ONLY FOR ABSOLUTE PROXIMITY TO ENDPOINT)  C     0740
      IF (ABS(YON(K+1)-YIN(1)).GT.ABS(YTEST)) GO TO 50                  C     075
      IF (ABS(XON(K+1)-XIN(1)).GT.ABS(XTEST)) GO TO 50                  C     076
      K=K+1                                                         C     0770
      IF (ISTAR.EQ.0) DS=DS*1.2                                     C     0780
      GO TO 20                                                      C     0790
   50 DELS1=DELS                                                    C     0800
      XON(K+1)=XIN(2)                                               C     0810
      YON(K+1)=YIN(2)                                               C     0820
      NBDY1=K+1                                                     C     0830
      K=K+1                                                         C     0840
      DO 55 KAL=NFIRST,K                                            C     0850
   55 ALPHA(KAL)=ALPHA(KAL)/PI0180                                  C     0860
      RETURN                                                        C     0870
      END                                                           C     0880
```

```
      FUNCTION FNTRP (A,F,X,NA)                                     S    0000
C.....FUNCTION EVALUATION FOR DOUBLE 3-POINT INTERPOLATION.         S    0010
      REAL F(NA)                                                    S    0020
      COMMON /NTRPC2/ I1,I2,C(4)                                    S    0030
C.....FIRST EVALUATE FUNCTION COEFFICIENTS.                         S    0040
      CALL FNTRPA (A,X,NA)                                          S    0050
      CALL FNTRPC                                                   S    0060
C.....THEN EVALUATE FUNCTION VALUE.                                 S    0070
      ENTRY FNTRP1 (F)                                              S    0080
      FNTRP=0.0                                                     S    0090
      J=0                                                           S    0100
      DO 10 I=I1,I2                                                 S    0110
      J=J+1                                                         S    0120
   10 FNTRP=FNTRP+C(J)*F(I)                                         S    0130
      RETURN                                                        S    0140
      END                                                           S    0150
```

```
      SUBROUTINE NTRPFA (A,X,NA)                                        V
C.....COMMON SUBROUTINE EVALUATES A COEFFICIENTS IN DOUBLE              V
C.....3-POINT INTERPOLATIONS.                                           V
C       L=NO. OF POINTS IN THE FIT                                      V
C       I=INDEX TO FIRST POINT                                          V
      REAL A(NA)                                                        V
      COMMON /NTRPCI/ L,I,A11,A12,A13,A14,A22,A23,A24,A33,A34,A44       V
C.....GET I AND L BY TABLE LOOK-UP.                                     V
      L=LIMIT (1,NA,3)                                                  V
      M=MAX0(1,NA-2)                                                    V
      CALL TLU (A,X,NA,J)                                               V
      IF (J.EQ.LIMIT(2,J,M)) L=4                                        V
      I=LIMIT(1,J-1,M)                                                  V
C.....CALCULATE A-ARRAY.                                                V
      A11=A(I)                                                          V
      A22=A(I+1)                                                        V
      A33=A(I+2)                                                        V
      IF (L.NE.4) IF (L-2) 20,15,10                                     V
      A44=A(I+3)                                                        V
      A14=A11-A44                                                       V
      A24=A22-A44                                                       V
      A34=A33-A44                                                       V
      A44=X-A44                                                         V
   10 A13=A11-A33                                                       V
      A23=A22-A33                                                       V
      A33=X-A33                                                         V
   15 A12=A11-A22                                                       V
      A22=X-A22                                                         V
      A11=X-A11                                                         V
   20 RETURN                                                            V
      END                                                               V
```

```
      SUBROUTINE FNTRPC
C.....CALCULATION OF C COEFFICIENTS FOR FUNCTION VALUES BY DOUBLE
C.....3-POINT INTERPOLATION.
      COMMON /NTRPC1/L,I,A11,A12,A13,A14,A22,A23,A24,A33,A34,A44
      COMMON /NTRPC2/ I1,I2,C1,C2,C3,C4
      IF (L.LE.1) GO TO 25
      IF (L-3) 20,15,10
C.....FOR DOUBLE 3-POINT INTERPOLATION.
   10 C1=+A33/A23*A22/A12*A33/A13
      C4=-A22/A23*A33/A34*A22/A24
      P2=A33/A23*A11/A23
      P3=A22/A23*A44/A23
      C2=-A33*(P2/A12+P3/A24)
      C3=+A22*(P3/A34+P2/A13)
      GO TO 30
C.....FOR SIMPLE 3-POINT INTERPOLATION.
   15 C1=+A22/A12*A33/A13
      C2=-A11/A12*A33/A23
      C3=+A11/A13*A22/A23
      GO TO 30
C.....FOR 2-POINT INTERPOLATION.
   20 C1=+A22/A12
      C2=-A11/A12
      GO TO 30
C.....ONLY ONE TABLE VALUE GIVEN.
   25 C1=1.0
   30 I1=I
      I2=I+L-1
      RETURN
      END
```

```
      SUBROUTINE FONISO(P,Q,LL)
C((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((
C
C     FOR THE BI-SUPERELLIPSE,  F(P,Q) = (X/A)**P + (Y/B)**Q - 1 = 0.
C
C     IF LL =           AND GIVEN                  FIND
C     1                 Q,X1,Y1                    P
C     2                 P,X1,Y1                    Q
C     3                 X1,Y1,X2,Y2                P AND Q
C     4                 X1,Y1                      P = Q = N
C     5                 X1,Y1,SLOPE AT(X1,Y1)      P AND Q
C     6                 (XI, )=INFLECTION PT,      P,Q,AND Y1
C                       PLUS SLOPE AT (X1, )
C
      REAL LOGXOA,LOGYOB
      DIMENSION OX(2),OY(2)
      COMMON/TRYFIT/KOUNT
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON/SUPN/ XOA(2),YOB(2),LOGXOA(2),LOGYOB(2)
      COMMON/SENSE/  X(2),Y(2),A,B,INFLEC
      DATA TOL/.1E-6/
      YI=Y(1)
      XI=X(1)
      OX(1)= XIN(3)
      OX(2)=XIN(6)
      OY(1)= YIN(3)
      OY(2)=YIN(6)
      DO 20 I=1,2
      IF (KOUNT.GT.1) GO TO 20
      IF (I.EQ.2.AND.LL.NE.3) GO TO 20
      OA= XOA(I)
      OB= YOB(I)
      IF ((OB+OA).LE.1.0) GO TO 10
      IF (OB.GE.1.0.OR.OA.GE.1.0) GO TO 15
      GO TO 20
   10 WRITE (6,90)OX(I),OY(I)
      GO TO 20
   15 WRITE (6,85)OX(I),OY(I)
      STOP
   20 CONTINUE
      IF (LL.NE.6) GO TO 25
      P=1.5
      Q=.5
   25 IF (LL.NE.6) GO TO 30
      YOB(1)= Y(1)/B
      LOGYOB(1)=ALOG(YOB(1))
      XOA(1)=X(1)/A
      LOGXOA(1)=ALOG(XOA(1))
   30 XOATP1= XOA(1)**P
      YOBTQ1= YOB(1)**Q
      DFDPA1= XOATP1*LOGXOA(1)
      F1= XOATP1 + YOBTQ1 -1.
      DFDQA1 = YOBTQ1*LOGYOB(1)
      GO TO (55,60,35,65,70,70),LL
   35 XOATP2 = XOA(2)**P
      YOBTQ2 = YOB(2)**Q
```

```
      DFDQA2 = YOBTQ2 * LOGYOB(2)
      F2 = XOATP2 + YOBTQ2 - 1.
      DFDPA2 = XOATP2*LOGXOA(2)
   40 QN = (F1*DFDPA2/(DFDQA2*DFDPA1)-F2/DFDQA2)/(1. - DFDPA2*DFDQA1/(DF
     1DPA1*DFDQA2))  + Q
      PN =((Q-QN)*DFDQA1 -F1)/DFDPA1 +  P
   45 TESTP=ABS(PN-P)/P -TOL
      TESTQ=ABS(QN-Q)/Q -TOL
      Q=QN
      P=PN
      IF (TESTP.GT.0..OR.TESTQ.GT.0.) GO TO 25
   50 RETURN
   55 PN= -F1/DFDPA1 + P
      TESTP=ABS(PN-P)/P -TOL
      P=PN
      IF (TESTP) 50,25,25
   60 QN= -F1/DFDQA1 +Q
      TESTQ=ABS(QN-Q)/Q -TOL
      Q=QN
      IF (TESTQ) 50,25,25
   65 DFDQA1= YOBTQ1*LOGYOB(1)
      PN=-F1/(DFDPA1+DFDQA1) +P
      TESTP= ABS(PN-P)/P -TOL
      P=PN
      Q=P
      IF (TESTP) 50,25,25
   70 DYDX= (Y(2)-YI   )/(X(2)-XI   )
      F2=DYDX+   P*XOATP1*Y(1)/Q/YOBTQ1/X(1)
      EOCALD= - P*XOATP1*Y(1)/Q/YOBTQ1/X(1)
      DFDQA2=       - (ALOG(B)-1./Q-ALOG(Y(1)))*EOCALD
      DFDPA2=       - (1./P -ALOG(A)+ ALOG(X(1)))*EOCALD
      IF (LL.EQ.6) GO TO 75
      GO TO 40
   75 EOCALD= - P*XOATP1*Y(1)/Q/YOBTQ1/X(1)
      G=F2
      DGDP= DFDPA2
      DGDQ= DFDQA2
      H = EOCALD*((P-1.)/X(1)+((1.-Q)/Y(1))*EOCALD)
      DHDP  = EOCALD*((P-1.)/X(1)+((1.-Q)/Y(1))*EOCALD)*(1./P-ALOG(A)+AL
     1OG(X(1)))+EOCALD*(1./X(1) +((1.-Q)/Y(1))*EOCALD*(1./P-ALOG(A)+ALOG
     2(X(1))))
      DHDQ  = EOCALD*((P-1.)/X(1)+((1.-Q)/Y(1))*EOCALD)*(-1./Q+ALOG(B)-A
     1LOG(Y(1)))+EOCALD*(-EOCALD/Y(1)+((1.-Q)/Y(1))*EOCALD*(-1./Q+ALOG(B
     2)-ALOG(Y(1))))
      DFDY= Q/Y(1)*YOBTQ1
      IF(INFLEC.EQ.1)DFDY=P/X(1)*XOATP1
      DGDY= EOCALD*(Q-1.)/Y(1)
      IF(INFLEC.EQ.1)
     1               DGDY=EOCALD*(1.-P)/X(1)
      EOCAL2=2.*EOCALD
      DHDY= EOCALD*(((P-1.)/X(1)+((1.-Q)/Y(1))*EOCAL2)*((1.-Q)/Y(1))+EOCAL
     1D*(Q-1.)/Y(1))/Y(1))
      IF(INFLEC.EQ.1)
     1               DHDY=EOCALD/X(1)*(P-1.)*((P-2.)/X(1)+2.*EOCALD*(1.-Q)/Y
     1(1))
      WRONSK=DFDPA1*(DGDQ*DHDY-DGDY*DHDQ)-DFDQA1*(DGDP*DHDY-DGDY*DHDP)+
     1DFDY*(DGDP*DHDQ-DGDQ*DHDP)
```

```
      QN=Q+(F1*(DGDP*DHDY-DGDY*DHDP)-G*(DFDPA1*DHDY-DFDY*DHDP)+H*(DFDPA1I
     1*DGDY-DFDY*DGDP))/WRONSK                                         I
      PN=P+(-F1*(DGDQ*DHDY-DGDY*DHDQ)+G*(DFDQA1*DHDY-DFDY*DHDQ)-H*(DFDQAI
     11*DGDY-DFDY*DGDQ))/WRONSK                                        I
      YN=Y(1)+(DHDP*(P-PN)+DHDQ*(Q-QN)-H)/DHDY                         I
      IF(INFLEC.EQ.1)                                                  I
     1                 YN=X(1)+(DHDP*(P-PN)+DHDQ*(Q-QN)-H)/DHDY        I
      TESTY=ABS(YN-Y(1))/Y(1) - 1.E-05                                 I
      IF(INFLEC.EQ.1)                                                  I
     1                   TESTY=ABS(YN-X(1))/X(1) - 1.E-05              I
      IF(INFLEC.NE.1 ) Y(1)=YN                                         I
      IF(INFLEC.EQ.1)                                                  I
     1X(1)=YN                                                          I
      IF (TESTY) 45,45,80                                              I
   80 Q=QN                                                             I
      P=PN                                                             I
      GO TO 25                                                         I
   85 FORMAT(1H0,42H THIS POINT IS OUTSIDE THE MAGIC TRIANGLE,,2E15.4/ I
     2                                                              52HI
     1 THIS CONDITION IS NOT VALID FOR ANY CASE. REVISE       )        I
   90 FORMAT(1H0,42H THIS POINT IS BELOW   THE MAGIC TRIANGLE,,2E15.4/52I
     1H THIS CONDITION IS VALID ONLY FOR THE BISUPERLLLIPSE/72H WITH INFI
     1LECTION(P OR Q LESS THAN 1.). SUCH A CURVE HAS BEEN GENERATED   ) I
C((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((I
      END                                                              I
```

```
SO.FRSTS                                                                24 NOV 76  09
      SUBROUTINE FRSTSH (K)                                                D   0000
C                                                                          D   0010
C     FIRST STRAIGHT SEGMENT SHROUD                                        D   0020
C                                                                          D   0030
C     IF THERE IS NO HUB INTERCHANGE POINTS (X1,Y1) AND (X2,Y2)            D   0040
C            AND TREAT LIKE FINAL STRAIGHT SECTION ON THE HUB,             D   0050
C            THEN REVERSE XON AND YON ARRAYS                               D   0060
C                                                                          D   0070
C                                                                          D   0080
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PI02,DELS1,IHUB                 D   0090
      COMMON /FOR3SS/ID,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500D   0100
     1),ALPHA(500),CAPPA(500),SON(500),PI0180                              D   0110
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS                                D   0120
      COMMON /FNST/ NFIRST                                                 D   0130
      DIMENSION XA(2), YA(2), DSV(500), ASV(500), XSV(500), YSV(500), SSD   0140
     1V(500)                                                               D   0150
      SON(K)=0.0                                                           D   0160
      IF (IHUB.EQ.1) GO TO 25                                              D   0170
      DO 10 I=1,2                                                          D   0180
      XA(I)=XIN(I)                                                         D   0190
   10 YA(I)=YIN(I)                                                         D   0200
      XIN(1)=XA(2)                                                         D   0210
      XIN(2)=XA(1)                                                         D   0220
      YIN(1)=YA(2)                                                         D   0230
      YIN(2)=YA(1)                                                         D   0240
      NFB2=K                                                               D   0250
      YON(K)=YIN(1)                                                        D   0260
      XON(K)=XIN(1)                                                        D   0270
      CALL FNSTRH (K)                                                      D   0280
      KSV=K                                                                D   0290
      DO 15 I=NFB2,KSV                                                     D   0300
      KSR=KSV+1-I                                                          D   0310
      DSV(KSR)=DYDXO(I)                                                    D   0320
      ASV(KSR)=ALPHA(I)                                                    D   0330
      XSV(KSR)=XON(I)                                                      D   0340
      YSV(KSR)=YON(I)                                                      D   0350
   15 SSV(I)  =SON(I)                                                      D   0360
      DO 20 I=NFB2,KSV                                                     D   0370
      DYDXO(I)=DSV(I)                                                      D   0380
      ALPHA(I)=ASV(I)                                                      D   0390
      XON(I)=XSV(I)                                                        D   0400
      YON(I)=YSV(I)                                                        D   0410
      SON(I)=SSV(KSV)-SSV(KSV+1-I)                                         D   0420
      CAPPA(I)=0.0                                                         D   0430
   20 CONTINUE                                                             D   0440
      DELS1=ABS(SON(KSV)-SON(KSV-1))                                       D   0450
      NBDY1=0                                                              D   0460
      RETURN                                                               D   0470
C                                                                          D   0480
C     IF THERE IS A HUB, USE X VALUES FROM FINAL STRAIGHT                  D   0490
C          SECTION ON THE HUB FOR FIRST STRAIGHT SECTION ON                D   0500
C             SHROUD                                                       D   0510
C                                                                          D   0520
   25 XTEST=XIN(1)-XIN(2)                                                  D   0530
      YTEST=YIN(1)-YIN(2)                                                  D   0540
      IF (XTEST.EQ.0.0) GO TO 30                                           D   0550
```

```
      DYDXC=YTEST/XTEST                                                  D    0560
      ALPHAC=ATAN2(YTEST,XTEST)                                          D    0570
      GO TO 35                                                           D    0580
   30 DYDXC=99999.                                                       D    0590
      ALPHAC=PI02                                                        D    0600
   35 K=K-1                                                              D    0610
      NBDC=NBDY1                                                         D    0620
      IF (TYPBDY.EQ.3.D.AND.NBDYS.EQ.3) NBDC=NBODY2                      D    0630
      DO 50 I=NFIRST,NBDC                                                D    0640
      KEEP=NBDC+NFIRST-I                                                 D    0650
      XON(K+1)=XON(KEEP)                                                 D    0660
      DYDXO(K+1)=DYDXC                                                   D    0670
      ALPHA(K+1)=ALPHAC                                                  D    0680
      IF (I.EQ.NFIRST) GO TO 40                                          D    0690
      YON(K+1)=YON(K)+(XON(K+1)-XON(K))*DYDXC                            D    0700
      SON(K+1)=SON(K)+(XON(K)-XON(K+1))/COS(ALPHAC)                      D    0710
      GO TO 45                                                           D    0720
   40 YON(K+1)=YIN(1)+(XON(K+1)-XIN(1))*DYDXC                            D    0730
   45 CAPPA(K+1)=0.0                                                     D    0740
      ALPHA(K+1)=ALPHA(K+1)/PI0180                                       D    0750
      K=K+1                                                              D    0760
   50 CONTINUE                                                           D    0770
      DELS1=SON(K)-SON(K-1)                                              D    0780
      RETURN                                                             D    0790
      END                                                                D    0800
```

```
      COMPLEX FUNCTION FZTRP (A,F,X,NA)                                T 0000
C.....COMPLEX FUNCTION EVALUATION BY DOUBLE 3-POINT INTERPOLATION.     T 0010
      COMPLEX F(NA)                                                    T 0020
      COMMON /NTRPC2/ I1,I2,C(4)                                       T 0030
C.....FIRST EVALUATE FUNCTION COEFFICIENTS.                            T 0040
      CALL FNTRPA (A,X,NA)                                             T 0050
      CALL FNTRPC                                                      T 0060
C.....THEN EVALUATE FUNCTION VALUE.                                    T 0070
      FZTRP=0.0                                                        T 0080
      J=0                                                              T 0090
      DO 10 I=I1,I2                                                    T 0100
      J=J+1                                                            T 0110
   10 FZTRP=FZTRP+C(J)*F(I)                                            T 0120
      RETURN                                                           T 0130
      END                                                              T 0140
```

```
      SUBROUTINE LEM (K)
C
      SUBROUTINE TO CALCULATE POINTS ON A LEMNISCATE
C
      COMMON /FOR3SS/ID,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      DELSIN=DELS1
      K=K-1
      KSTART=K
      DELS=DELS1
      KOUNT=0
      IF (YIN(1).EQ.YIN(2)) GO TO 30
      IF (XIN(1).EQ.XIN(2)) GO TO 10
      SLOPE=(YIN(2)-YIN(1))/(XIN(2)-XIN(1))
      AROT=-TAN(SLOPE)
      GO TO 15
   10 SLOPE=99999.
      AROT=-PIO2
   15 DO 20 IROT=1,3
      XN=XIN(IROT)
      XIN(IROT)=XN*COS(AROT)-YIN(IROT)*SIN(AROT)
   20 YIN(IROT)=XN*SIN(AROT)+YIN(IROT)*COS(AROT)
   25 K=KSTART
   30 XON(K+1)=XIN(2)
      THETMX=ATAN(ABS((YIN(3)-YIN(2))/(XIN(3)-XIN(2))))
      A=SQRT(((XIN(3)-XIN(2))**2+(YIN(3)-YIN(2))**2)/(2.0*SIN(2.0*THETMX
     1)))
      YON(K+1)=YIN(2)
      CAPPA(K+1)=0.0
      DYDXO(K+1)=0.0
      ALPHA(K+1)=0.0
      KOUNT=KOUNT+1
      DSSAVE=DELS
      DS=DELS
      DTHET=DS**2/A**2
      THET=DTHET*.5
   35 R=A*SQRT(2.0*SIN(2.0*THET))
      DSCHEK=R*COS(THET)
      IF (DSCHEK.GT.1.1*DS) GO TO 40
      IF (DSCHEK.LT..9*DS) GO TO 45
      DELS=DS
      GO TO 50
   40 THET=THET-.02*DTHET
      GO TO 35
   45 THET=THET+.02*DTHET
      GO TO 35
   50 K=K+1
   55 R=A*SQRT(2.0*SIN(2.0*THET))
      XON(K+1)=XIN(2)-R*COS(THET)
      YON(K+1)=YIN(2)+R*SIN(THET)
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      IF (ABS(SON(K+1)-SON(K)).GT.1.05*DS) GO TO 60
      IF (ABS(SON(K+1)-SON(K)).LT..95*DS) GO TO 65
      GO TO 70
```

```
   60 THET=THET-.02*DTHET
      GO TO 55
   65 THET=THET+.02*DTHET
      GO TO 55
   70 DYDXO(K+1)=-TAN(3.0*THET)
      ALPHA(K+1)=-3.0*THET
      CAPPA(K+1)=3.0*SQRT(SIN(2.0*THET)/2.0)/A
      DS=DELS/SQRT(1.0+ABS(CAPPA(K+1)))
      IF (ABS(DS-DSSAVE).GT..25*DSSAVE) DS=DSSAVE+SIGN(.25*DSSAVE,DS-DSS
     1AVE)
      DSSAVE=DS
      DTHET=DS*SQRT(SIN(2.0*THET)/2.0)/A
      THET=THET+DTHET
      IF (THET.LE.THETMX) GO TO 50
      IF (KOUNT.GT.50) GO TO 95
      DSTEST=((XON(K+1)-XIN(3))**2+(YON(K+1)-YIN(3))**2)**.5
      IF (DSTEST.GT.DS) GO TO 90
      IF (DSTEST.LT..001*DS) GO TO 75
      IF (DSTEST-.5*DS) 85,85,80
   75 YON(K+1)=YIN(3)
      XON(K+1)=XIN(3)
      GO TO 95
   80 DELS=DELS-DSTEST/FLOAT(K+1-KSTART)
      GO TO 25
   85 DELS=DELS+DSTEST/FLOAT(K+1-KSTART)
      GO TO 25
   90 DELS=.8*DELS
      GO TO 25
   95 DELS1=DS*1.2
      IF (DELS1.GT.DELS) DELS1=DELS
      WRITE (6,115)KOUNT,THETMX,A
      WRITE (6,120)DELSIN,DELS,DELS1,DSTEST
      KEND=K+1
      KSTART=KSTART+1
      IF (YIN(2).EQ.YIN(1)) GO TO 105
      DO 100 KROT=KSTART,KEND
      XN=XON(KROT)
      XON(KROT)=XN*COS(AROT)+YON(KROT)*SIN(AROT)
      YON(KROT)=YON(KROT)*COS(AROT)-XN*SIN(AROT)
      ALPHA(KROT)=ALPHA(KROT)-AROT
      DYDXO(KROT)=TAN(ALPHA(KROT))
  100 CONTINUE
  105 DO 110 KAL=KSTART,KEND
  110 ALPHA(KAL)=ALPHA(KAL)/PI0180
      RETURN
C
C
  115 FORMAT (3X,I3,2X,13HITERATIONS---,3X,13HTHETMXCALC = ,F10.5,3X,8HAL
     1CALC = ,F10.5)
  120 FORMAT (3X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = ,
     1F8.5,3X,9HDSTEST = ,F8.5)
      END
```

SO.LIMITS 07 OCT 76 14

```
      FUNCTION LIMIT (I,J,K)
C.....INTEGER FUNCTION LIMITS J BETWEEN I AND K.
      LIMIT=I
      IF (J.LT.LIMIT) RETURN
      LIMIT=K
      IF (J.GT.LIMIT) RETURN
      LIMIT=J
      RETURN
      END
```

```
      SUBROUTINE MIRROR (K,YCL)
C
C     THIS SUBROUTINE MIRRORS THE HUB TO OBTAIN THE POINTS ON SHROUD
C             USED  FOR  22Y  -  2-D INLETS
C
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PI0180
      COMMON /SS/ NBDY1,NBDY2,TYPBDY,NBDYS
      DO 10 J=1,NBDY1
      K=K+1
      ISTAR=1+2*NBDY1-K
      XON(K)=XON(ISTAR)
      YON(K)=2.0*YCL-YON(ISTAR)
      CAPPA(K)=-CAPPA(ISTAR)
      DYDXO(K)=-DYDXO(ISTAR)
      ALPHA(K)=-ALPHA(ISTAR)
      SON(K)=SON(ISTAR)
   10 CONTINUE
      WRITE (6,15)YCL
      RETURN
C
   15 FORMAT (34H0HUB MIRRORED INTO Y CENTERLINE = ,F8.3)
      END
```

```
SO.ISPLOX                                                              07 OCT 76  14
      SUBROUTINE PLOXIS(XX,YY,EXEP,ORD,OFSETA,OFSET,SLETRS,SNOSZ,K5,K6,KZ3   0000
     1,L,NK,NL)                                                          Z3   0010
C                                                                        Z3   0020
C%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%Z3   0030
C%%%%%%   SUBROUTINE ADDED TO DRAW AND LABEL AXIS FRAMES FOR ALL PLOTS %Z3   0040
      COMMON/TITL/ TTITL(9,6)                                            Z3   0050
      UP =11.-YY-2.*SNOSZ                                                Z3   0060
      M1=XX                                                              Z3   0070
      M2=YY                                                              Z3   0080
      CALL PLOT(4.,-11.,-3)                                              Z3   0090
      CALL PLOT(0.,UP,-3)                                                Z3   0100
      DO 25 I=1,M1                                                       Z3   0110
      X=I                                                                Z3   0120
      P=EXEP*X +OFSETA                                                   Z3   0130
      CALL PLOT(X,0.,2)                                                  Z3   0140
      CALL PLOT(X, .2,2)                                                 Z3   0150
      M=I/2                                                              Z3   0160
      B=FLOAT(I)-FLOAT(M)-X/2.                                           Z3   0170
      IF (B) 10,10,25                                                    Z3   0180
   10 IF (K5) 15,15,20                                                   Z3   0190
   15 CALL NUMBER(X-SNOSZ,-SNOSZ-.10,SNOSZ,P,0.,NK)                      Z3   0200
      GO TO 25                                                           Z3   0210
   20 SN = 1.333*SNOSZ                                                   Z3   0220
      CALL NUMBER(X-SNOSZ-SNOSZ,-SN-SNOSZ-.10,SN,10.,0.,-1)              Z3   0230
      CALL NUMBER(999.0,-SNOSZ -.10,SNOSZ,P,0.,NK)                       Z3   0240
   25 CALL PLOT(X,0.,3)                                                  Z3   0250
      B = (XX-54.*SLETRS)/2.                                             Z3   0260
      CALL SYMBOL(B,-SNOSZ-SLETRS-.15-.6,SLETRS,TTITL(1,K),0.,54)        Z3   0270
      CALL PLOT(0.,0.,3)                                                 Z3   0280
      DO 45 J=1,M2                                                       Z3   0290
      Y=J                                                                Z3   0300
      O=ORD*Y+OFSET                                                      Z3   0310
      CALL PLOT(0.,Y,2)                                                  Z3   0320
      CALL PLOT(.2,Y,2)                                                  Z3   0330
      N=J/2                                                              Z3   0340
      B=FLOAT(J)-FLOAT(N)-Y/2.                                           Z3   0350
      IF (B) 30,30,45                                                    Z3   0360
   30 IF (K5) 35,35,40                                                   Z3   0370
   35 CALL NUMBER(-4.*SNOSZ          -.15,Y,SNOSZ,O,0.,NL)               Z3   0380
      GO TO 45                                                           Z3   0390
   40 SN = 1.333*SNOSZ                                                   Z3   0400
      CALL NUMBER(-.15 -SN-SN-SN    ,Y-SNOSZ,SN,10.,0.,-1)               Z3   0410
      CALL NUMBER(999.0,Y+SN-SNOSZ,SNOSZ,O,0.,NL)                        Z3   0420
   45 CALL PLOT(0.,Y,3)                                                  Z3   0430
      C = (YY-54.*SLETRS)/2.                                             Z3   0440
      CALL SYMBOL(-SNOSZ-SNOSZ-SNOSZ-.15-.6,C,SLETRS,TTITL(1,L),90.,54) Z3   0450
      CALL PLOT(0.,YY,3)                                                 Z3   0460
      CALL PLOT(XX,YY,2)                                                 Z3   0470
      CALL PLOT(XX,0.,2)                                                 Z3   0480
      DO 50 J=1,M2,2                                                     Z3   0490
      Y=J                                                                Z3   0500
      IF (Y.EQ.YY) GO TO 55                                              Z3   0510
      CALL PLOT(XX,Y,3)                                                  Z3   0520
      CALL PLOT(0.,Y,2)                                                  Z3   0530
      IF ((Y+1.).EQ.YY) GO TO 55                                         Z3   0540
      CALL PLOT(0.,Y+1.,3)                                               Z3   0550
```

```
   50 CALL PLOT(XX,Y+1.,2)
   55 CONTINUE
      DO 60 J=1,M1,2
      X=J
      IF (X.EQ.XX) GO TO 65
      CALL PLOT(XX-X,YY,3)
      CALL PLOT(XX-X,0.,2)
      IF ((XX-X-1.).EQ.0.) GO TO 65
      CALL PLOT(XX-X-1.,0.,3)
   60 CALL PLOT(XX-X-1.,YY,2)
   65 RETURN
      END
```

```
      SUBROUTINE PRELPS (KODE,KAT,IA,K1,K2)
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PI02,DELS1,IHUB
      COMMON /FOR3SS/ID,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PI0180
      COMMON /SPREP/ KPREP
      KPREP=1
      IL=IA
      IF (KAT.EQ.1) GO TO 60
      KID=KODE
      X1=XIN(1)
      Y1=YIN(1)
      IF (IA.EQ.5) GO TO 10
      XC=XIN(4)
      YC=YIN(4)
      GO TO 15
   10 XC=XIN(5)
      YC=YIN(5)
      IL=IA+1
   15 DO 45 IB=1,IL
      IF (IB.NE.6) GO TO 20
      IF (ABS(XIN(6))+ABS(YIN(6)).LE.1.E-15.OR.YIN(6).EQ.200.) GO TO 45
      IF (YIN(6).NE.-100.) GO TO 20
      XIN(6)=-XIN(6)
      GO TO 45
   20 GO TO (25,30,35,40,30,40),KODE
   25 YIN(IB)=YIN(IA)-(YIN(IB)-YIN(IA))
      GO TO 45
   30 XIN(IB)=XIN(1)-(XIN(IB)-XIN(1))
      GO TO 45
   35 YIN(IB)=YIN(1)-(YIN(IB)-YIN(1))
      GO TO 45
   40 XIN(IB)=XIN(IA)-(XIN(IB)-XIN(IA))
   45 CONTINUE
      IF (KODE.EQ.5) GO TO 50
      IF (KODE.EQ.6) GO TO 55
      RETURN
   50 KODE=1
      GO TO 15
   55 KODE=3
      GO TO 15
   60 DO 90 IB=K1,K2
      GO TO (65,70,75,80,65,75),KID
   65 YON(IB)=YC-(YON(IB)-YC)
      GO TO 85
   70 XON(IB)=X1-(XON(IB)-X1)
      GO TO 85
   75 YON(IB)=Y1-(YON(IB)-Y1)
      GO TO 85
   80 XON(IB)=XC-(XON(IB)-XC)
   85 DYDXO(IB)=-DYDXO(IB)
   90 CONTINUE
      IF (KID.EQ.5) GO TO 95
      IF (KID.EQ.6) GO TO 100
      RETURN
   95 KID=2
      GO TO 60
```

```
  100 KID=4
      GO TO 60
      END
```

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```
      INTEGER FUNCTION SGEN (S,F,NS)
C.....GENERATES THE PARAMETER ARRAY S FOR THE SET OF POINT-PAIRS F SUCH
C.....THAT S(I) GIVES THE LINE INTEGRAL ON THE CURVE OF FZTRP (S,F,X,NS)
C.....WHEN X=S(I).
      REAL S(NS)
      COMPLEX F(NS),DZTRP
      DATA MAX,N,FN,TEST/4,10,10.0,0.01/
      DO 10 I=2,NS
   10 S(I)=S(I-1)+CABS(F(I)-F(I-1))
      DO 30 K=1,MAX
      SGEN=0
      DO 25 I=2,NS
      DS=S(I)-S(I-1)
      DARG=DS/FN
      ARGO=S(I-1)-DARG/2.0
      SUM=0.0
      DO 15 J=1,N
      ARG=ARGO+FLOAT(J)*DARG
   15 SUM=SUM+(CABS(DZTRP(S,F,ARG,NS))-1.0)
      SUM=SUM/FN
      ERROR=ABS(SUM)
      DS=DS*SUM
      DO 20 J=I,NS
   20 S(J)=S(J)+DS
      IF (ERROR.GT.TEST.AND.SGEN.EQ.0) SGEN=I
   25 CONTINUE
      IF (SGEN.EQ.0) RETURN
   30 CONTINUE
C.....SGEN=INDEX IF IT DOESN'T CONVERGE.
      RETURN
      END
```

```
C   ..................................................................
C
C      SUBROUTINE SIMQ
C
C      PURPOSE
C         OBTAIN SOLUTION OF A SET OF SIMULTANEOUS LINEAR EQUATIONS,
C         AX=B
C      USAGE
C         CALL SIMQ(A,B,N,KS)
C
C      DESCRIPTION OF PARAMETERS
C         A - MATRIX OF COEFFICIENTS STORED COLUMNWISE.  THESE ARE
C             DESTROYED IN THE COMPUTATION.  THE SIZE OF MATRIX A IS
C             N BY N.
C         B - VECTOR OF ORIGINAL CONSTANTS (LENGTH N). THESE ARE
C             REPLACED BY FINAL SOLUTION VALUES, VECTOR X.
C         N - NUMBER OF EQUATIONS AND VARIABLES. N MUST BE .GT. ONE.
C         KS - OUTPUT DIGIT
C              0 FOR A NORMAL SOLUTION
C              1 FOR A SINGULAR SET OF EQUATIONS
C
C      REMARKS
C         MATRIX A MUST BE GENERAL.
C         IF MATRIX IS SINGULAR , SOLUTION VALUES ARE MEANINGLESS.
C         AN ALTERNATIVE SOLUTION MAY BE OBTAINED BY USING MATRIX
C         INVERSION (MINV) AND MATRIX PRODUCT (GMPRD).
C
C      SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C         NONE
C
C      METHOD
C         METHOD OF SOLUTION IS BY ELIMINATION USING LARGEST PIVOTAL
C         DIVISOR. EACH STAGE OF ELIMINATION CONSISTS OF INTERCHANGING
C         ROWS WHEN NECESSARY TO AVOID DIVISION BY ZERO OR SMALL
C         ELEMENTS.
C         THE FORWARD SOLUTION TO OBTAIN VARIABLE N IS DONE IN
C         N STAGES. THE BACK SOLUTION FOR THE OTHER VARIABLES IS
C         CALCULATED BY SUCCESSIVE SUBSTITUTIONS. FINAL SOLUTION
C         VALUES ARE DEVELOPED IN VECTOR B, WITH VARIABLE 1 IN B(1),
C         VARIABLE 2 IN B(2),........., VARIABLE N IN B(N).
C         IF NO PIVOT CAN BE FOUND EXCEEDING A TOLERANCE OF 0.0,
C         THE MATRIX IS CONSIDERED SINGULAR AND KS IS SET TO 1. THIS
C         TOLERANCE CAN BE MODIFIED BY REPLACING THE FIRST STATEMENT.
C
C   ..................................................................
C
      SUBROUTINE SIMQ (A,B,N,KS)
      DIMENSION A(1), B(1)
C
C      FORWARD SOLUTION
C
      TOL=0.0
      KS=0
      JJ=-N
      DO 65 J=1,N
      JY=J+1
```

```
      JJ=JJ+N+1
      BIGA=0
      IT=JJ-J
      DO 15 I=J,N
C
C        SEARCH FOR MAXIMUM COEFFICIENT IN COLUMN
C
      IJ=IT+I
      IF (ABS(BIGA)-ABS(A(IJ))) 10,15,15
   10 BIGA=A(IJ)
      IMAX=I
   15 CONTINUE
C
C        TEST FOR PIVOT LESS THAN TOLERANCE (SINGULAR MATRIX)
C
      IF (ABS(BIGA)-TOL) 20,20,25
   20 KS=1
      RETURN
C
C        INTERCHANGE ROWS IF NECESSARY
C
   25 I1=J+N*(J-2)
      IT=IMAX-J
      DO 30 K=J,N
      I1=I1+N
      I2=I1+IT
      SAVE=A(I1)
      A(I1)=A(I2)
      A(I2)=SAVE
C
C        DIVIDE EQUATION BY LEADING COEFFICIENT
C
   30 A(I1)=A(I1)/BIGA
      SAVE=B(IMAX)
      B(IMAX)=B(J)
      B(J)=SAVE/BIGA
C
C        ELIMINATE NEXT VARIABLE
C
      IF (J-N) 35,50,35
   35 IOS=N*(J-1)
      DO 45 IX=JY,N
      IXJ=IOS+IX
      IT=J-IX
      DO 40 JX=JY,N
      IXJX=N*(JX-1)+IX
      JJX=IXJX+IT
   40 A(IXJX)=A(IXJX)-(A(IXJ)*A(JJX))
   45 B(IX)=B(IX)-(B(J)*A(IXJ))
C
C        BACK SOLUTION
C
   50 NY=N-1
      IT=N*N
      DO 55 J=1,NY
      IA=IT-J
      IB=N-J
```

```
      IC=N
      DO 55 K=1,J
      B(IB)=B(IB)-A(IA)*B(IC)
      IA=IA-N
   55 IC=IC-1
      RETURN
      END
```

```
SO.SINTPO                                                    07 OCT 76  14
      SUBROUTINE SINTP (Z,W,N,X1,Y1)
C((((( ENLARGED FROM THE ORIGINAL (200)
      DIMENSION A(13)
      DIMENSION X(250), Y(250), Z(250), W(250)
      DATA EODFF/6HENDOFF/
      DO 10 I=1,N
      X(I)=Z(I)
   10 Y(I)=W(I)
      CALL SORTXY (X,Y,N)
C
      DO 15 I=1,N
      K=I
      IF (X1.GT.X(I)) GO TO 15
      IF (X1.EQ.X(I)) GO TO 20
      IF (X1.LT.X(I)) GO TO 25
   15 CONTINUE
   20 Y1=Y(K)
      GO TO 30
   25 IF (K.EQ.1) GO TO 35
      IF (K.EQ.N) K=N-1
      W1=(X1-X(K))*(X1-X(K+1))/(X(K-1)-X(K))/(X(K-1)-X(K+1))
      W2=(X1-X(K-1))*(X1-X(K+1))/(X(K)-X(K-1))/(X(K)-X(K+1))
      W3=(X1-X(K-1))*(X1-X(K))/(X(K+1)-X(K-1))/(X(K+1)-X(K))
      Y1=Y(K-1)*W1+Y(K)*W2+Y(K+1)*W3
   30 RETURN
   35 Y1=0.0
      RETURN
      ENTRY ECHO
      CALL ERTRAN(6,'@ASG,T 25. . ')
      WRITE (6,40)
   40 FORMAT(1H1,23X,' INPUT FILE DUMP'/)
   45 READ (5,50,END=60)A
   50 FORMAT(13A6)
      WRITE (6,55)A
      WRITE (25,50)A
   55 FORMAT(1H ,13A6)
      GO TO 45
   60 WRITE (25,50)EODFF
       REWIND 25
      RETURN
      END
```

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```
      SUBROUTINE SORTXY(X,Y,NPTS)
      DIMENSION X(100),Y(100)
   10 N=NPTS
   15 NN=N-1
   20 DO 55 KT=1,NN
      XMIN=X(KT)
      JAD=KT
      JKL=KT+1
   25 DO 45 JK=JKL,N
   30 IF (XMIN-X(JK)) 45,45,35
   35 XMIN=X(JK)
   40 JAD=JK
   45 CONTINUE
   50 YMIN=Y(JAD)
      X(JAD)=X(KT)
      Y(JAD)=Y(KT)
      X(KT)=XMIN
      Y(KT)=YMIN
   55 CONTINUE
      RETURN
      END
```

```
      LOGICAL FUNCTION SPGEN (S,Z,C,NS,SP,NSP,SFIN,NMAX)
C.....GENERATES TABLE SP HAVING VALUES OF PARAMETER S AS WIDELY SPACED
C     AS POSSIBLE AND YET SATISFYING THE FOLLOWING CONDITIONS ON DS
C        1   NSP .LE. NMAX
C        2   DS  .LE. A/C(S)     (C=CURVATURE)
C        3   DS  .LE. DSMAX
C        4A  DS(I) .LE. DS(I-1)*RMAX
C        4B  DS(I) .GE. DS(I-1)/RMAX
C     FOR THIN SECTIONS, AN ADDITIONAL CONDITION IS
C            DS  .LE. B*TLOC     (TLOC=LOCAL THICHNESS)
C.....SPGEN = .TRUE. IF ALL CONDITIONS HAVE BEEN SATISFIED.

      REAL S(NS),C(NS),SP(NMAX)
      COMPLEX Z(NS),FZTRP
      LOGICAL THIN,FIN
      COMMON /SPGENC/      A,DSMAX,RMAX,THIN,B,TMIN,DSEND
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      DATA ONE,CHIN/1.0001,1.0E-6/

C.....INITIALIZATION SECTION.
      SPGEN=.FALSE.
      J1=MAX0(NSP,2)+1
      IF (NSP.GT.1) GO TO 15
      IF (NSP.LT.1) SP(1)=S(1)
      DS1=        DELS1
   10 SP(2)=SP(1)+DS1

C.....BEGIN MAIN LOOP.
   15 DO 45 J=J1,NMAX
      L=J
   20 I=L
   25 DSLAST=SP(I-1)-SP(I-2)
      SBAR=SP(I-1)+DSLAST/2.0
      CA=AMAX1(CHIN,ABS(FNTRP(S,C,SBAR,NS)))
      DSLIM=AMIN1(DS1   ,DSLAST*RMAX)
      IF (.NOT.THIN) GO TO 30
      TLOC=CABS(FZTRP(S,Z,SBAR,NS)-FZTRP(S,Z,S(NS)-SBAR,NS))
      DSLIM=AMIN1(DSLIM,B*AMAX1(TLOC,TMIN))
   30 DSFIN=SFIN-SP(I-1)
      NEVEN=DSFIN/DSLIM/ONE+1.0
      DSEVEN=DSFIN/FLOAT(NEVEN)
      DS=AMIN1(A/CA,DSEVEN)
      IF (I.NE.J) DS=AMIN1(DS,DSLAST/RMAX)

C.....CALCULATED VALUE OF DS SATISFIES CONDITIONS 2 THRU 4A.TEST FOR 4B.
      IF (DS.GE.DSLAST/RMAX) GO TO 40

C.....IF CONDITION 4B IS NOT SATISFIED, RE-DO EARLIER INTERVALS
C.....USING SMALLER VALUES OF DS.  IF RE-DOING ALL INTERVALS WON'T
C.....WORK, START OVER USING SMALLER STARTING VALUE OF DS (DS1).
   35 L=L-1
      IF (L.GE.J1) GO TO 25
      IF (NSP.GT.1) RETURN
      DS1=DS1/RMAX
      GO TO 10

```

```
C.....IF CONDITIONS 2 THRU 4B ARE SATISFIED, TEST FOR FINISH.
   40 SP(I)=SP(I-1)+DS
      FIN=SFIN/SP(I).LE.ONE
      IF (FIN.AND.DS.GT.DSEND) GO TO 35
      IF (FIN) GO TO 50
      IF (I.GE.J) GO TO 45
      I=I+1
      GO TO 25
   45 CONTINUE
C.....SPGEN =.FALSE. IF CONDITION 1 CANNOT BE SATISFIED.
      RETURN

C.....IF CONDITIONS ARE SATISFIED, UPDATE NSP.
   50 NSP=1
      DELS1=DS
      SPGEN=.TRUE.
      RETURN
      END
```

```
      SUBROUTINE STRAIT (K,ISHR)
C
C      A REGULAR STRAIGHT SEGMENT
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /FNST/ NFIRST
      COMMON /NHIGH/ NSPHG,NLAST,XLAST(500)
      KFIRST=K
      XTEST=XIN(2)-XIN(1)
      YTEST=YIN(2)-YIN(1)
      IF (XTEST.EQ.0.0) GO TO 10
      DYDXC=YTEST/XTEST
      ALPHAC=ATAN(YTEST/XTEST)
      GO TO 15
   10 DYDXC=99999.
      ALPHAC=PIO2
C
C     CALCULATE DELSNW
C
   15 STOT=SQRT(XTEST**2+YTEST**2)
      ANDS=STOT/DELS1
      AINDS=AINT(ANDS)
      TEST=ANDS-AINDS
      IF (TEST.GE..5) AINDS=AINDS+1.0
      DELSNW=STOT/AINDS
      DELSNW=ABS(DELSNW)
      DELS1=DELSNW
      DELS=DELS1
      IF (YTEST) 20,35,20
   20 IF (XTEST.EQ.0.0) GO TO 50
      DYDXO(K+1)=DYDXC
      ALPHA(K+1)=ALPHAC
      SIGN=1.0
      IF (XTEST.LT.0.0) SIGN=-1.0
      YON(K+1)=YON(K)+SIGN*DELSNW*SIN(ALPHA(K+1))
      IF (NSPHG.EQ.0) GO TO 25
      XON(K+1)=XON(NLAST-1)
      NLAST=NLAST-1
      GO TO 30
   25 XON(K+1)=XON(K)+SIGN*DELSNW*COS(ALPHA(K+1))
   30 SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      CAPPA(K+1)=0.0
      IF (XTEST.LT.0.0.AND.XON(K+1).LE.XIN(2).OR.XTEST.GT.0.0.AND.XON(K+
     11).GE.XIN(2)) GO TO 55
      IF (ABS(XON(K+1)-XIN(2)).LE.1.0E-4*DELS.AND.ABS(YON(K+1)-YIN(2)).L
     1E.1.0E-4*DELS) GO TO 60
      K=K+1
      GO TO 20
   35 DYDXO(K+1)=0.0
      ALPHA(K+1)=0.0
      SIGN=1.0
      IF (XTEST.LT.0.0) SIGN=-1.0
      IF (NSPHG.EQ.0) GO TO 40
```

```
      XON(K+1)=XON(NLAST-1)
      NLAST=NLAST-1
      GO TO 45
   40 XON(K+1)=XON(K)+SIGN*DELSNW
   45 YON(K+1)=YON(K)
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      CAPPA(K+1)=0.0
      IF (XTEST.LT.0.0.AND.XON(K+1).LE.XIN(2).OR.XTEST.GT.0.0.AND.XON(K+
     11).GE.XIN(2)) GO TO 55
      IF (ABS(XON(K+1)-XIN(2)).LE.1.0E-4*DELS.AND.ABS(YON(K+1)-YIN(2)).L
     1E.1.0E-4*DELS) GO TO 60
      K=K+1
      GO TO 35
   50 DYDXO(K+1)=99999.
      ALPHA(K+1)=PIO2
      SIGN=1.0
      IF (YTEST.LT.0.0) SIGN=-1.0
      XON(K+1)=XON(K)
      YON(K+1)=YON(K)+SIGN*DELSNW
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      CAPPA(K+1)=0.0
      IF (YTEST.LT.0.0.AND.YON(K+1).LE.YIN(2).OR.YTEST.GT.0.0.AND.YON(K+
     11).GE.YIN(2)) GO TO 55
      IF (ABS(XON(K+1)-XIN(2)).LE.1.0E-4*DELS.AND.ABS(YON(K+1)-YIN(2)).L
     1E.1.0E-4*DELS) GO TO 60
      K=K+1
      GO TO 50
   55 IF (ABS(XON(K+1)-XIN(2)).LE.1.0E-3*DELS.AND.ABS(YON(K+1)-YIN(2)).L
     1E.1.0E-3*DELS) GO TO 60
      K=K-1
   60 K=K+1
      DO 65 KAL=KFIRST,K
   65 ALPHA(KAL)=ALPHA(KAL)/PIO180
      RETURN
      END
```

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```
      SUBROUTINE SUPERC (XBRK,YBRK,ENREED,DELS1,ISTART)                  H   0000
      DIMENSION ENREED(2)                                                H   0010
      DIMENSION XBRK(6), YBRK(6), XBK1(13), YBK1(13)                     H   0020
      REAL LOGXOA,LOGYOB                                                 H   0030
      COMMON /SUPF/ IFLD                                                 H   0040
      COMMON /FOR3SS/ID,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500H    0050
     1),ALPHA(500),CAPPA(500),SON(500),PIO180                            H   0060
      COMMON/SUPN/ XOA(2),YOB(2),LOGXOA(2),LOGYOB(2)                     H   0070
      COMMON /NHIGH/ NSPHG,NLAST,XLAST(500),YLAST(500)                   H   0080
      COMMON/SENSE/ X8(2),Y8(2),A,B,INFLEC                               H   0090
      COMMON /SPREP/ KPREP                                               H   0100
      COMMON/PAC/ PACE,DELSHL                                            H   0110
      COMMON/TRYFIT/KOUNT                                                H   0120
      IPI=0                                                              H   0130
      PI=3.14159265                                                      H   0140
      IF (IFLD.EQ.1) DELSHL=DELS1                                        H   0150
      DELSIN=DELS1                                                       H   0160
      DELS2=DELS1                                                        H   0170
      KOUNT=0                                                            H   0180
   10 II=ISTART                                                          H   0190
      IF (IFLD.GE.1) DS=DELS2                                            H   0200
      KOUNT=KOUNT+1                                                      H   0210
      I=ISTART                                                           H   0220
      X4T=XBRK(4)                                                        H   0230
      Y4T=YBRK(4)                                                        H   0240
C((((((( FOR SUBSEQUENT ITERATIONS, SKIP LL INITIALIZATION.              H   0250
      IF ((LL.GE.5.OR.LL.LT.-5).AND.KOUNT.NE.1) GO TO 50                 H   0260
      LL=0                                                               H   0270
C(((((((  FLAG FOR ENDPT. CURVATURE MATCH IS YBRK(6)=200.               H   0280
      IF (YBRK(6)-200.) 40,15,40                                         H   0290
   15 CAP=-ABS(XBRK(6))                                                  H   0300
      LL=-8                                                              H   0310
      IF (XBRK(6).NE.999.) GO TO 50                                      H   0320
      IF (XBRK(3).NE.XBRK(2)) GO TO 20                                   H   0330
C((((((( IF THE PT. WHERE  CURVATURES MUST MATCH HAS INFIN. SLOPE,       H   0340
C((((((( OBTAIN CURVATURE FROM PREVIOUS SEGMENT'S EXPONENTS.             H   0350
      IF (XBRK(2).NE.XBRK(1)) GO TO 25                                   H   0360
      LL=-8                                                              H   0370
      CAP=-2.*A/X8(1)/B/B                                                H   0380
      GO TO 50                                                           H   0390
   20 IF (XBRK(5).NE.XBRK(4)) GO TO 25                                   H   0400
      LL=-8                                                              H   0410
      CAP=-2.*A/X8(1)/B/B                                                H   0420
      GO TO 50                                                           H   0430
   25 IF(XBRK(6).EQ.999.)XBRK(6)=  CAPPA(ISTART)                         H   0440
      IF (XBRK(6).EQ.0..OR.ABS(XBRK(6)).GE.99999.) GO TO 30              H   0450
      CAP=-ABS(XBRK(6))                                                  H   0460
      GO TO 50                                                           H   0470
   30 WRITE (6,35)                                                       H   0480
   35 FORMAT(1H0,3X,99HREQUEST FOR SPECIFIC CURVATURE MUST BE MODIFIED OH    0490
     1R WITHDRAWN. DESIRED CURVATURE CAN'T=0. OR INFINTY)                H   0500
      STOP                                                               H   0510
C(((((((   POINT-PLUS-SLOPE FLAG IS    YBRK(6)= -100.                    H   0520
   40 IF (YBRK(6)+100.) 50,45,50                                         H   0530
   45 LL= 5                                                              H   0540
C((((((( ADDITIONAL FLAG FOR INFLECTION-POINT-PLUS-SLOPE IS  YBRK(3)= 100H    0550
```

```
      IF(YBRK(3).EQ.100.) LL=6
C(((((FOR INITIAL GUESS OF UNKNOWN Y AT INFLECTION POINT,USE ENDPT. AVG.
      IF(LL.EQ.6) YBRK(3)= YBRK(2)+(XBRK(2)-XBRK(3))/(XBRK(2)-XBRK(4))*(
     1YBRK(4)-YBRK(2))
C(((((( CREATE A DUMMY POINT TO SIMULATE THE GIVEN SLOPE THROUGH
C   (XBRK(3),YBRK(3))
      YBRK(6)= XBRK(6)*((XBRK(3)+5.)-XBRK(3)) +YBRK(3)
      XBRK(6)= XBRK(3)+5.
   50 DO 55 J=1,6
      XBK1(J+7)=XBRK(J)
      YBK1(J+7)=YBRK(J)
   55 CONTINUE
      IF (XBK1(9).NE.XBK1(8)) GO TO 65
      IF (YBK1(8).LT.YBK1(9)) GO TO 60
      SLOP=99999.
      SINATD=1.0
      SLOPE=99999.
      ATDYDD=90.
      COSATD=0.0
      GO TO 80
   60 SLOP=-99999.
      SINATD=-1.0
      SLOPE=-99999.
      ATDYDD=-90.
      COSATD=0.0
      GO TO 80
   65 SLOP=(YBK1(9)-YBK1(8))/(XBK1(9)-XBK1(8))
      SLOPE=ATAN(SLOP)
      ATDYDD=SLOPE/PIO180
      IF (XBK1(8)-XBK1(9)) 70,75,75
   70 SLOPE=PI+SLOPE
      ATDYDD=-ATDYDD
      IPI=1
   75 SINATD=SIN(SLOPE)
      COSATD=COS(SLOPE)
   80 CONTINUE
      INFLEC = ABS(INT(SINATD))
      XBK(8)=XBK1(8)
      YBK(8)=YBK1(8)
      DO 85 J=9,13
      XP=XBK1(J)-XBK1(8)
      YP=YBK1(J)-YBK1(8)
      XBK(J)=XBK1(8)+XP*COSATD+YP*SINATD
      YBK(J)=YBK1(8)-XP*SINATD+YP*COSATD
   85 CONTINUE
      Q=1.
      P=1.
      XBK(5)=XBK(8)

      YBK(5)=YBK(8)
      XBK(6)=XBK(9)
      YBK(6)=YBK(9)
      XBK(9)=XBK(10)
      YBK(9)=YBK(10)
      DELS=DELSI
      DSSAVE=DELS
      XTH=XBK1(9)
```

```
      YTM=YBK1(9)

      B=YBK(11)-YBK(6)
      TOMEGA=(XBK(12)-XBK(11))/(YBK(12)-YBK(11))
      IF (ABS(TOMEGA).LE..0001) TOMEGA=0.
      OMEGA=ATAN(TOMEGA)
      XO=XBK(6)+B*TOMEGA
      YO=YBK(11)
      A=XO-XBK(11)
      XI9=XO-XBK(9)
      ETA9=YO-YBK(9)
      YB(1)=ETA9
      XB(1)=XI9-ETA9*TOMEGA
      XB(2)=XO-XBK(13)-TOMEGA*(YO-YBK(13))
      YB(2)=YO-YBK(13)
      BOA=B/A
      IF (LL.GE.5) GO TO 90
      IF (LL.LE.-6) GO TO 105
      LL=0
      IF(ENREED(1).GT.0.) P=ENREED(1)
      IF(ENREED(2).GT.0.) Q=ENREED(2)
      IF(P.EQ.1.) LL=1
      IF(Q.EQ.1.) LL=LL+2
      IF (LL.EQ.0) GO TO 115
   90 XOA(1)=XB(1)/A
      YOB(1)=YB(1)/B
      LOGXOA(1)=ALOG(XOA(1))
      LOGYOB(1)=ALOG(YOB(1))
      IF (XBRK(6).EQ.0..AND.LL.EQ.3) GO TO 95
      IF (LL.NE.3) GO TO 100
      XOA(2)=XB(2)/A
      YOB(2)=YB(2)/B
      LOGXOA(2)=ALOG(XOA(2))
      LOGYOB(2)=ALOG(YOB(2))
      GO TO 100
   95 LL=4
  100 CALL FONTSD(P,Q,LL)
      GO TO 115
C((((((  FOR CURVATURE MATCH, NO ITERATION REQD. BUT ONE EXPONENT MUST=2
  105 IF(XBRK(3).EQ.XBRK(2))P=2.
      IF(XBRK(3).EQ.XBRK(4))Q=2.
C(((((( OBTAIN OTHER EXPONENT FROM ENDPOINT CURVATURE RELATION
  110 IF(P .EQ. 2.)  Q= -2.*B/CAP/A/A
      IF(Q .EQ. 2. .AND. P .NE. 2.)  P=-2.*A/CAP/B/B
  115 IF (KOUNT.NE.1) GO TO 120
      WRITE (6,475)P,A,XO,Q,B,YO,OMEGA
  120 I=1
      ILO=I
      XON(I)=XON1(I)
      C1ON=1./P
      BT=B*TOMEGA
      DX1=DELS*COSATD
      XP=XTM-XBK1(8)
      YP=YTM-YBK1(8)
      XI1ROT=XBK1(8)+XP*COSATD+YP*SINATD
      XI=XO-XI1ROT
      Y=YO-YBK(6)
```

```
      X=XI-Y*TOMEGA
      IF (X.LT.0.0) X=0.0
      DSM=SON(I)-SON(I-1)
  125 XOATON=(X/A)**P
      YOBTON=(Y/B)**Q
C((((((  AVOID (.LE. 0.)**(.LE. 0.)
      IF (P.GE.1.) GO TO 135
      IF (X.NE.0.) GO TO 130
      XNMOAN=99999.
      GO TO 140
  130 XNMOAN=(1./X)**(1.-P)/A**P
      GO TO 140
  135 XNMOAN=X**(P-1.)/A**P
  140 IF (Q.GE.1.) GO TO 150
      IF (Y.NE.0.) GO TO 145
      YNMOBN=9999.
      GO TO 155
  145 YNMOBN=(1./Y)**(1.-Q)/B**Q
      GO TO 155
  150 YNMOBN=Y**(Q-1.)/B**Q
  155 FOFY=XOATON+YOBTON-1.
      IF (ABS(FOFY).LE.1.0E-5) GO TO 160
      FPOFY=Q*YNMOBN-TOMEGA*P*XNMOAN
      YNEW=Y-FOFY/FPOFY
      GO TO 165
  160 YNEW=Y
  165 IF (ABS(Y-YNEW)/YNEW-.1E-4) 175,175,170
  170 Y=YNEW
      X=XI-Y*TOMEGA
      GO TO 125
  175 Y=YNEW
      X=XI-Y*TOMEGA
  180 ETA=Y
      DELS=DELS2
      IPN=1
      IF (X.LT.0.0) X=0.0
C((((((  AVOID (.LE. 0.)**(.LE. 0.)
      IF (P.GE.1.) GO TO 190
      IF (X.NE.0.) GO TO 185
      XOANM1= 99999.
      GO TO 195
  185 XOANM1=(A/X)**(1.-P)
      GO TO 195
  190 XOANM1=(X/A)**(P-1.)
  195 IF (Q.GE.1.) GO TO 205
      IF (Y.NE.0.) GO TO 200
      YOBNM1= 99999.
      GO TO 210
  200 YOBNM1= (B/Y)**(1.-Q)
      GO TO 210
  205 YOBNM1=(Y/B)**(Q-1.)
  210 F1=(XOANM1/A)*P
      F2=(YOBNM1/B)*Q
      F3=TOMEGA*F1
      IF (X.EQ.0.0) GO TO 225
      IF (P.GE.2.) GO TO 215
      F1OX=P*(1./X)**(2.-P)/A**P
```

```
      GO TO 220
  215 F1OX=P*X**(P-2.)/A**P
  220 GO TO 230
  225 IF(P.EQ.2.) F1OX=2.0/(A*A)
      IF(P.GT.2.) F1OX=0.0
  230 IF (Y.EQ.0.0) GO TO 240
      IF (Q.GE.2.) GO TO 235
      F2OY=Q*(1./Y)**(2.-Q)/B**Q
      GO TO 245
  235 F2OY=Q*Y**(Q-2.)/B**Q
      GO TO 245
  240 IF(Q.EQ.2.) F2OY=2./(B*B)
      IF(Q.GT.2.) F2OY=0.
  245 DEN=F2-F3
      IF (DEN.NE.0.0) GO TO 250
      DETDXI=99999.
      GO TO 255
  250 DETDXI=-F1/DEN
  255 DYDXO(IPN)=DETDXI
      C1MEPT=1.-DETDXI*TOMEGA
      IF (IPN.EQ.ISTART.AND.LL.LE.-6) GO TO 260
C((((((  ELIMINATE CASES OF UNDEFINED CURVATURE
      IF (X.EQ.0..AND.P.LT.2.) GO TO 265
      IF (Y.EQ.0..AND.Q.LT.2.) GO TO 265
      G1=(P-1.)*F1OX*C1MEPT
      SAND1=DEN*G1
      SAND2=F1*((Q -1.)*F2OY*DETDXI-G1*TOMEGA)
      IF(ABS(DETDXI).GT.1.E 11) DETDXI=1.E 11
      BKT=(1.+DETDXI**2)**1.5
      CAPPA(IPN)=(SAND2-SAND1)/DEN**2/BKT
      IF(P.EQ.2..AND.X.EQ.0.)CAPPA(IPN)=-2.*B/Q/A/A
      IF(Q.EQ.2..AND.ABS(Y).LT.1.E-4)CAPPA(IPN)=-2.*A/P/B/B
      GO TO 270
  260 IF(P.EQ.2.)CAPPA(IPN)=-2.*B/Q/A/A
      IF(Q.EQ.2.)CAPPA(IPN)=-2.*A/P/B/B
      GO TO 270
  265 CAPPA(IPN)=99999.
  270 ALPHA(IPN)=ATAN(DYDXO(IPN))/PIO180
      XON(IPN)=XO-XI
      YON(IPN)=YO-ETA
      DY1=DELS*SINATO
      IF (IFLD.GE.1) GO TO 275
      DS=DELS/(1.0+.20*TANH(ABS(CAPPA(1))))
      GO TO 285
  275 IF (IFLD.GT.1.AND.(IPN-ISTART).GT.3) GO TO 280
      DS=DS-PACE*DS
      GO TO 290
  280 DS=DS+1.5*PACE*DS
      IF (DS.GT.DELSHL) DS=DELSHL
      GO TO 290
  285 IF (ABS(DS-DELS).GT..20*DELS) DS=DELS+SIGN(.20*DELS,DS-DELS)
  290 IF (DS.LT..02*DELS2) DS=.02*DELS2
      IF (IFLD.GT.0.AND.(I-ISTART).GT.200) GO TO 410
      IF (NSPHL.EQ.0) GO TO 295
      DX1=ABS(XLAST(NLAST)-XLAST(NLAST-1))
      DX11=DX1
      DY1=ABS(YLAST(NLAST)-YLAST(NLAST-1))
```

```
      NLAST=NLAST-1
  295 IF (ABS(DETDXI)-1.) 320,320,300
  300 DY1=DS/SQRT(1.+1./DETDXI**2)
      IF (NSPHG.NE.0) DY1=DX1
  305 YTM=YON(I)+DY1
      IF (YTM-YBK(1)) 310,390,390
  310 ETA=YO-YTM
      Y=ETA
C
C     STRAIGHT SECTION BETWEEN POINTS 11 AND 12 MUST HAVE SLOPE ABOVE 1
C
C
C     X MAY NOT BE TESTED AGAINST XBK(1)
C
      X=A*(1.-(Y/B)**Q)**CION
      XI=X+Y*TOMEGA
      XTM=XO-XI
      DX1=XTM-XON(I)
      DELTAS=SQRT(DY1**2+DX1**2)
      IF (DELTAS.GT.1.02*DS.AND.IPN.NE.1.AND.NSPHG.EQ.0) GO TO 315
      GO TO 390
  315 DY1=DS*DY1/DELTAS
      GO TO 305
  320 DX1=DS/SQRT(1.+DETDXI**2)
      IF (NSPHG.NE.0) DX1=DY1
      IF (NSPHG.NE.0.AND.IPI.EQ.1) DX1=DX11
  325 XTM=XON(I)+SIGN(DX1,DETDXI)
      IF (DETDXI.EQ.0.) XTM=XON(I)-DX1
      XI=XO-XTM
      Y=YO-YON(I)
  330 X=XI-Y*TOMEGA
      IF (X.LT.0.0) X=0.0
      XOATON=(X/A)**P
      YOBTON=(Y/B)**Q
C((((((  AVOID (.LE. 0.)**(.LE. 0.)
      IF (P.GE.1.) GO TO 340
      IF (X.NE.0.) GO TO 335
      XNMOAN=99999.
      GO TO 345
  335 XNMOAN=(1./X)**(1.-P)/A**P
      GO TO 345
  340 XNMOAN=X**(P-1.)/A**P
  345 IF (Q.GE.1.) GO TO 355
      IF (Y.NE.0.) GO TO 350
      YNMOBN=9999.
      GO TO 360
  350 YNMOBN=(1./Y)**(1.-Q)/B**Q
      GO TO 360
  355 YNMOBN=Y**(Q-1.)/B**Q
  360 FOFY=XOATON+YOBTON-1.
      IF (ABS(FOFY).LE.1.0E-5) GO TO 365
      FPOFY=Q*YNMOBN-TOMEGA*P*XNMOAN
      YNEW=Y-FOFY/FPOFY
      GO TO 370
  365 YNEW=Y
  370 IF (ABS(Y-YNEW)/YNEW-.1E-4) 380,380,375
  375 Y=YNEW
```

```
      GO TO 330
  380 Y=YNEW
      X=XI-Y*TOMEGA
      YTM=YO-Y
      XI=X+Y*TOMEGA
C     DYI=YTM-YON(I-1)
      DYI=YTM-YON(I)
      DELTAS=SQRT(DYI**2+DXI**2)
      IF (DELTAS.GT.1.02*DS.AND.IPN.NE.I.AND.NSPHG.EQ.0) GO TO 385
      GO TO 390
  385 DXI=DS*DXI/DELTAS
      GO TO 325
  390 SON(I)=SON(I-1)+DSM
      DSM=DS
      IF (NSPHG.NE.0) DS=DXI
      IF (ABS(YTM-YBK(11)).LT..001*DS) GO TO 403
      I=I+1
      IF (YTM-YBK(11)) 180,395,395
  395 IHI=I-1
      GO TO 405
  400 IHI=I
      I=I+1
  405 XTM=XBK(11)
      IIHI=IHI
  410 IF (IFLD.LE.0.OR.(I-ISTART).LT.200) GO TO 415
      IF(IFLD.EQ.1)                     PACE=PACE-.25*PACE
      IF(IFLD.EQ.2)                     PACE=PACE+.25*PACE
      I=ILO-1
      GO TO 10
  415 DO 455 J=ILO,IHI
      XP=XON(J)-XBK1(8)
      YP=YON(J)-YBK1(8)
      XON(J)=XBK1(8)+XP*COSATD-YP*SINATD
      YON(J)=YBK1(8)+XP*SINATD+YP*COSATD
      DEL22=DELS2
      IF (J.NE.IHI) GO TO 445
      DSTEST=((XON(IHI)-X4T)**2+(YON(IHI)-Y4T)**2)**.5
      IF (KOUNT.GT.150) GO TO 445
      IF (ABS(DS-DSTEST).LT..1*DS) GO TO 420
      IF (DSTEST.LT..01*DS) GO TO 425
      IF (IHI.EQ.ILO) GO TO 440
      IF (ABS(DELS2-DSTEST).LT..001*DS) GO TO 435
      IF (DSTEST.LT..5*DS) GO TO 435
      IF (DSTEST.GT..5*DS) GO TO 430
C((((((     VIA BUTTON 175/74
  420 IIHI=IIHI+1
      I=I+1
      IONE=IIHI-1
      SON(IIHI)=SON(IONE   )+DSTEST
  425 IIHI=IIHI+1
      IONE=IIHI-1
      XON(IONE   )=X4T
      YON(IONE   )=Y4T
      GO TO 445
  430 IF (IFLD.GT.1) GO TO 435
      DELS2=(FLOAT(IHI-ILO)*DELS2+DSTEST)/FLOAT(IHI+1-ILO)
      IF (KOUNT.GE.10) DELS2=(DELS2+DEL22)/2.0
```

```
      I=ILO-1
      GO TO 10
  435 DELS2=DELS2+DSTEST/FLOAT(IHI-ILO)
      IF (KOUNT.GE.10) DELS2=(DELS2+DEL22)/2.)
      IF(IFLD.GT.1.AND.(DS/DEL22).GT.2.)
     1PACE=PACE*((1.+DSTEST/DEL22/(FLOAT(IHI-ILO)*(1.+1.5*PACE)**FLOAT(IH
     2I-ILO-1)-((1.+1.5*PACE)**FLOAT(IHI-ILO)-1.)/1.5/PACE))
      IF(IFLD.GT.1.AND.(DS/DEL22).GT.2.)DELS2=DEL22
      I=ILO-1
      GO TO 10
  440 DELS2=.8*DELS2
      I=ILO-1
      GO TO 10
  445 ALPHA(J)=ALPHA(J)-ATDYDD
      IF (ABS(ABS(ALPHA(J))-90.).LE.1.0E-4) GO TO 450
      DYDXO(J)=TAN(ALPHA(J)*PIO180)
      GO TO 455
  450 DYDXO(J)=SIGN(999.,ALPHA(J))
  455 CONTINUE
      IHI=IONE
      IF (KOUNT.GT.150) WRITE (6,480)(XBRK(IUB),YBRK(IUB),IUB=1,5)
      DELS1=DS
      IF (IFLD.EQ.0) DELS1=1.1*DS
      IF (DELS1.GT.DELS2.AND.IFLD.LE.1)DELS1=DELS2
      DO 465 J=ILO,IHI
      IF (J.EQ.1) GO TO 460
      SON(J)=SON(J-1)+SQRT((XON(J)-XON(J-1))**2+(YON(J)-YON(J-1))**2)
      GO TO 465
  460 SON(J)=0.0
  465 CONTINUE
      WRITE (6,485)KOUNT
      WRITE (6,490)DELSTN,DELS2,DELS1,DSTEST
      IF (IFLD.GT.0) WRITE (6,470)PACE
  470 FORMAT(1H+,87X,'FINAL PACE= ',F8.5)
      IO=1
      X8(1)=P
      X8(2)=Q
      XDIF=XBRK(4)-XBRK(5)
      IF(ABS(XDIF).LT.1.E-15)XDIF=SIGN(1.E-15,XDIF)
      DYDXO(IO-1)=(YBRK(4)-YBRK(5))/XDIF
      IF(ABS(DYDXO(IO-1)).GT.99999.)DYDXO(IO-1)=SIGN(99999.,DYDXO(IO-1))
      ALPHA(IO-1)=ATAN(DYDXO(IO-1))/PIO180
      IF(CAPPA(IO-1).EQ.0..AND.P.EQ.2..AND.Q.EQ.2.)CAPPA(IO-1)=-2.*A/B
     1/B
      RETURN
C
C
  475 FORMAT(1X/4X,4HP = ,E16.8,4X,4HA = ,E16.8,7X,5HXO = ,E16.8/4X,4HQ 
     1= ,E16.8,4X,4HB = ,E16.8,7X,5HYO = ,E16.8,3X,8HOMEGA = ,F16.8/1X) 
  480 FORMAT (1H0,60HTHIS SET OF DATA EXCEEDED 150ITERATIONS ''CULATION
     1S STOPPED/5X,4HXBRK,5X,4HYBRK/5X,1P10E13.3)
  485 FORMAT (1X,5X,I3,2X,13HITERATIONS---)
  490 FORMAT (6X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = ,
     1F8.5,3X,9HDSTEST = ,F8.5)
      END
```

```
SO.TESTY                                                         07 OCT 76   13
      SUBROUTINE TEST (IA)                                              E 0000
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PI02,DELS1,IHUB              E 0010
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500E 0020
     1),ALPHA(500),CAPPA(500),SON(500),PIO180                           E 0030
      COMMON /SPREP/ KPREP                                              E 0040
      M=IA-1                                                            E 0050
      IF (XIN(2).EQ.XIN(1)) GO TO 10                                    E 0060
      SLP1=(YIN(2)-YIN(1))/(XIN(2)-XIN(1))                              E 0070
      GO TO 15                                                          E 0080
   10 TEST1=(YIN(2)-YIN(1))/(XIN(M)-XIN(1))                             E 0090
      SLP1=SIGN(99999.,TEST1)                                           E 0100
   15 IF ((XIN(1).LT.XIN(M).AND.XIN(1).LE.XIN(2)).OR.(XIN(1).GE.XIN(2).AE 0110
     1ND.XIN(1).GT.XIN(M))) GO TO 20                                    E 0120
      TIP=XIN(1)-XIN(2)                                                 E 0130
      XIN(1)=XIN(1)+SIGN(50.,TIP)                                       E 0140
                                                   YIN(1)=(YIN(2)-YIN(1))*E 0150
     1(XIN(1)-XIN(2))/(XIN(2)-XIN(1)+SIGN(50.,TIP))+YIN(2)              E 0160
   20 SLP2=(YIN(M)-YIN(1))/(XIN(M)-XIN(1))                              E 0170
C                                                                       E 0180
C     ROTATION ONLY                                                     E 0190
C                                                                       E 0200
   25 IF (SLP1.GT.SLP2) RETURN                                          E 0210
C                                                                       E 0220
C     MIRROR INTO XIN(1)                                                E 0230
C                                                                       E 0240
   30 CALL PRELPS (2,0,IA,1,1)                                          E 0250
      RETURN                                                            E 0260
      END                                                               E 0270
```

```
SD.TLUS                                                        07 OCT 76   14
          SUBROUTINE TLU (TABLE,ARG,N,I)
C.....TABLE LOOK UP   FINDS I SUCH THAT ;
C         ARG.GE.TABLE(I).AND.ARG.LT.TABLE(I+1)
C           IF I=0, ARG.LT.TABLE(1)
C           IF I=N, ARG.GE.TABLE(N)
          REAL TABLE(N)
          I=LIMIT(1,I,N)
          IF (ARG.GE.TABLE(I)) GO TO 15
C.....DESCEND IN TABLE.
   10     I=I-1
          IF (I.LE.0) RETURN
          IF (ARG.GE.TABLE(I)) RETURN
          GO TO 10
C.....ASCEND IN TABLE.
   15     IF (I.GE.N) RETURN
          IF (ARG.LT.TABLE(I+1)) RETURN
          I=I+1
          GO TO 15
          END
```

```
      SUBROUTINE WPUNCH                                                Y  0000
      COMMON /FOREOD/ IGEOMF,ISIGF,ICURVN,NONEWF,IVORT                 Y  0010
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS                            Y  0020
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500Y  0030
     1),ALPHA(500),CAPPA(500),SON(500),PIO180                          Y  0040
      COMMON /MWRTE/ IFLAG,NDY4,PROG,TITLE(9),BODIES(4),IDENT,YLO(25),YHY  0050
     1I(25),NDY(25),XRAK(25),NBDPTS(5),NO6,NRAKES                      Y  0060
      COMMON/ LOT/XMIN,YMIN,ORD,EXEP,XX,YY,LPNCHO,IPLOTA,MM            Y  0070
      DIMENSION YOFF(200), XOFF(200), FI(500)                          Y  0080
      DIMENSION X(25),Y(25)                                            Y  0090
      COMMON /MNSD/ NNSD,NSDBDY(10)                                    Y  0100
      DATA BODYD/6H-BODY /,IFLAG1/4H 111/,IFLAG2/4H 1 1/,T22Y/6H   22Y/,Y  0110
     1IFLG2A/1H /,IFLG2B/1H1/                                          Y  0120
C                                                                      Y  0130
C     IF YLO AND YHI ARE READ IN AS ZERO,CALCULATE THEM FOR THAT RAKE  Y  0140
C          (FOR HUB AND SHROUD CASES ONLY)     1/4/73                  Y  0150
C                                                                      Y  0160
C     FIND HIGHLIGHT ON THE SHROUD                                     Y  0170
C                                                                      Y  0180
      NB=NBDPTS(1)+1                                                   Y  0190
      IF(IFLAG.EQ.1)NB=1                                               Y  0200
      NE=NBDPTS(2)                                                     Y  0210
C ( SET JMIN=LAST SHROUD PT., IN CASE X NEVER INCREASES ON SHROUD(VTOL) Y  0220
      JMIN=NE                                                          Y  0230
      DO 10 I=NB,NE                                                    Y  0240
      IF (XON(I+1).LT.XON(I)) GO TO 10                                 Y  0250
      JMIN=I                                                           Y  0260
      GO TO 15                                                         Y  0270
   10 CONTINUE                                                         Y  0280
   15 DO 20 I=1,NE                                                     Y  0290
   20 FI(I)=I                                                          Y  0300
      NOFF=0                                                           Y  0310
      IF (NRAKES.EQ.0) GO TO 70                                        Y  0320
      DO 65 I=1,NRAKES                                                 Y  0330
      NLO=NOFF+1                                                       Y  0340
      NOFF=NLO+NDY(I)                                                  Y  0350
      ENDY=NDY(I)                                                      Y  0360
      IF (YHI(I).EQ.0.0.OR.YLO(I).EQ.0.0) GO TO 25                     Y  0370
      GO TO 35                                                         Y  0380
   25 IF (YHI(I).NE.0.0) GO TO 30                                      Y  0390
      CALL SINTP (XON(NB),YON(NB),JMIN-NB+1,XRAK(I),YH)                Y  0400
      CALL SINTP (XON(NB),FI(NB),JMIN-NB+1,XRAK(I),FII)                Y  0410
      IF=FII                                                           Y  0420
      DS=SQRT((XON(IF)-XON(IF+1))**2+(YON(IF)-YON(IF+1))**2)           Y  0430
      YHI(I)=YH-DS                                                     Y  0440
   30 IF (YLO(I).NE.0.0.OR.XRAK(I).LT.XON(1)) GO TO 35                 Y  0450
      CALL SINTP (XON,YON,NBDPTS(1),XRAK(I),YL)                        Y  0460
      CALL SINTP (XON,FI,NBDPTS(1),XRAK(I),FII)                        Y  0470
      IF=FII                                                           Y  0480
      DS=SQRT((XON(IF)-XON(IF+1))**2+(YON(IF)-YON(IF+1))**2)           Y  0490
      YLO(I)=YL+DS                                                     Y  0500
   35 DYI=(YHI(I)-YLO(I))/ENDY                                         Y  0510
      K=0                                                              Y  0520
      DO 55 J=NLO,NOFF                                                 Y  0530
      DJM=J-NLO                                                        Y  0540
      XOFF(J)=XRAK(I)                                                  Y  0550
```

```
      YOFF(J)=YLO(I)+DYI*DJM
      IF (XOFF(J)-XMIN) 55,40,40
   40 IF (XOFF(J)-XX*EXEP-XMIN) 45,45,55
   45 IF (YOFF(J)-YY*ORD-YMIN) 50,50,55
   50 K=K+1
      X(K)=XOFF(J)
      Y(K)=YOFF(J)
   55 CONTINUE
C
C((((((   PLOT OFF-BODY POINTS (RAKES)
C
   60 CALL LINE(X,Y,K,1,-1,0,XMIN,EXEP,YMIN,ORD)
   65 CONTINUE
   70 NTBDY=NBDYS+NNSD+1-IVORT
      NLOOP=2-IVORT
      IF (NBDYS.EQ.3) GO TO 75
      GO TO 80
   75 NTBDY=NTBDY+1
      NLOOP=3
   80 M=0
      DO 110 I=1,NLOOP
      M=NTBDY-I+1
      IFLAGG=IFLAG2
      IF (M.EQ.NTBDY                    .OR.NBDYS.EQ.3.AND.M.EQ.3) IFLAGG=IFL
     1AG)
      IF (PROG.EQ.Y22Y) GO TO 85
C
C((((((   PUNCH OPTION ((((((
C
      IF (LPNCHO.EQ.0) GO TO 90
      WRITE (17,115)(TITLE(L),L=1,9),M,BODYD,IDENT
      WRITE (17,120)M,IFLAGG,N06,IVORT,IDENT
      GO TO 90
   85 IFLG22=IFLG2A
      IF (LPNCHO.EQ.1) WRITE (17,130)M,IFLG22,(TITLE(L),L=1,7),M,BODYD,I
     1DENT
   90 CONTINUE
      IF (LPNCHO.EQ.1) WRITE (17,125)IDENT
      NA=1
      NS=0
      IF (I.NE.1) K=1
      DO 105 J=1,M
      IF (J.GT.NBDYS.AND.NNSD.NE.0) GO TO 95
      NB=NBDPTS(J)
      GO TO 100
   95 NS=NS+1
      IF (NS.GT.NNSD) NSDBDY(NS)=NBDPTS(NBDYS+1)-NBDPTS(NBDYS)
      NB=NSDBDY(NS)+NA-1
  100 NP=NB-NA+1
      IF(LPNCHO.EQ.1)
     1CALL WRTXY (NP,IDENT,J,K,XON,YON,NA,NB,PROG)
      NA=NB+1
  105 CONTINUE
      K=0
      NA=1
      NB=NOFF
      J=0
```

```
      IF(LPNCHO.EQ.1)
     1CALL WRTXY (NOFF,IDENT,J,K,XOFF,YOFF,NA,NB,PROG)
      IF (PROG.NE.T22Y) GO TO 110
      IFLG22=IFLG2B
      IF (LPNCHO.EQ.0) GO TO 110
      WRITE (17,130)M,IFLG22,(TITLE(L),L=1,7),M,BODYD,IDENT
      WRITE (17,135)
  110 CONTINUE
      RETURN
C
C     FORMATS
C
C
C
  115 FORMAT (    9A6,I1,A5,2X,A6)
  120 FORMAT (    I1,A4,I1,8X,I1,47X,A6,11X)
  125 FORMAT (    52X,A6,11X)
  130 FORMAT (    I1,6H11    ,A1,4X,7A6,I1,A6,1X,A6)
  135 FORMAT (    3H0.0,7X,3H0.0,7X,3H90.)
      END
```

```
SO.WIRTXY                                                          08 OCT 76   08
          SUBROUTINE WRTXY (NP,IDENT,J,K,X,Y,NA,NB,PROG)              ZO  0000
C                                                                     ZO  0010
C         WRITE X AND Y COORDINATES                                   ZO  0020
C                                                                     ZO  0030
          DIMENSION X(1), Y(1)                                        ZO  0040
          COMMON /FORCOD/ IGEOMF,ISIGF,ICURVN,NONEWF,IVORT            ZO  0050
          DATA T22Y/6H   22Y/                                         ZO  0060
          WRITE (17,25)IGEOMF,ISIGF,ICURVN,NONEWF,NP,IDENT            ZO  0070
          IF (PROG.NE.T22Y) GO TO 15                                  ZO  0080
          IF (J.NE.0) GO TO 10                                        ZO  0090
          WRITE (17,45)J,K,IDENT                                      ZO  0100
          GO TO 20                                                    ZO  0110
       10 WRITE (17,40)J,K,IDENT                                      ZO  0120
          GO TO 20                                                    ZO  0130
       15 WRITE (17,30)J,K,IDENT                                      ZO  0140
       20 IF (K.EQ.1) RETURN                                          ZO  0150
          WRITE (17,35)(X(L),L=NA,NB)                                 ZO  0160
          WRITE (17,35)(Y(L),L=NA,NB)                                 ZO  0170
          RETURN                                                      ZO  0180
C                                                                     ZO  0190
C         FORMAT STATEMENTS                                           ZO  0200
C                                                                     ZO  0210
C                                                                     ZO  0220
C                                                                     ZO  0230
       25 FORMAT (4I1,3X,I3,52X,A6,11X)                               ZO  0240
       30 FORMAT (      9X,I1,9X,I1,42X,A6,11X)                       ZO  0250
       35 FORMAT(6E13.8)                                              ZO  0260
       40 FORMAT (      9X,I1,9X,1H1,9X,I1,32X,A6,11X)                ZO  0270
       45 FORMAT (      9X,I1,19X,I1,32X,A6,11X)                      ZO  0280
          END                                                         ZO  0290
```

```
      SUBROUTINE XYCALC(KSTART,K2,NIN)
C          -- XYCALC --
C.....GENERATES DATA FILES FOR ON-BODY POINTS.

      INTEGER SGEN
      REAL         X(300),Y(300),        C(300),S(300),SP(400)
      COMPLEX Z(300),DZ(300),D2Z,ZZ,FZTRP,DZTRP
      LOGICAL THIN,EVEN,SPGEN,DONE
      COMMON/SEGNO/NSEG,J
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /SPGENC/      A,DSMAX,RMAX,THIN,B,TMIN,DSEND
      COMMON /FOR3SS/ID,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      DATA NSMAX,NSS,EMPTY,ONE/300,200,1.0E20,1.0001/
      NAMELIST /BODYIN/ Z,S1
      NAMELIST /AUXIN/ A,DSMAX,RMAX,TMIN,B,NFIN,SP,NSP,DSEND,DONE,
     I                     EVEN,THIN

C.....INITIALIZE PROGRAM.
   10 DO 15 I=1,NSMAX
   15 Z(I)=EMPTY
      S1=0.0
      NMAX=400
      A=.17
      DSMAX=DELSMX
      THIN=.FALSE.
      RMAX=1.2
      DSEND=DSMAX
      DONE=.FALSE.
      EVEN=.FALSE.
      B=0.3
      TMIN=0.1
      NFIN=0
      NSP=0

C.....INPUT BODY POINTS AND BODY TYPE.
   20 READ (NIN,BODYIN)
      DO 25 I=1,NSMAX
      IF (REAL(Z(I)).EQ.EMPTY) GO TO 30
   25 NS=I
   30 S(1)=S1
      IBAD=SGEN(S,Z,NS)
      IF (IBAD.NE.0) WRITE (6,125)IBAD

C.....SET UP DERIVATIVES + CURVATURES.
      DO 35 I=1,NS
   35 DZ(I)=DZTRP(S,Z,S(I),NS)
      DO 40 I=1,NS
      D2Z=DZTRP(S,DZ,S(I),NS)
   40 C(I)=AIMAG(CONJG(DZ(I))*D2Z)/CABS(DZ(I))**3

C.....INPUT AUXILLIARY (CONTROL) DATA.
   45 READ (NIN,AUXIN)
      IF (NFIN.EQ.0) NFIN=NS
      SFIN=S(NFIN)
      DSMAX=AMAX1(DSMAX,DSEND)
```

```
      IF (EVEN) GO TO 50

C.....GENERATE BODY POINTS ON A SEGMENT.
      IF (.NOT.SPGEN(S,Z,C,NS,SP,NSP,SFIN,NMAX)) GO TO 130
      GO TO 80

C.....GENERATE UPPER AND LOWER SURFACES TOGETHER (EVEN).
   50 SHALF=SFIN/2.0
      IF (NSP.LT.1) GO TO 55
      IF (SP(NSP).GE.SHALF/ONE) GO TO 60
   55 IF (.NOT.SPGEN(S,Z,C,NS,SP,NSP,SHALF,NMAX)) GO TO 140
   60 SREM=(SFIN-SP(NSP))/ONE
      DO 65 I=1,NSP
      IF (SP(I).GE.SREM) GO TO 70
   65 CONTINUE
      GO TO 140
   70 IF (NSP+I-1.GT.NMAX) GO TO 150
   75 I=I-1
      IF (I.LT.1) GO TO 80
      NSP=NSP+1
      SP(NSP)=SFIN-SP(I)
      GO TO 75

C.....TEST FOR FINISH.
   80 IF (DONE) GO TO 85
      GO TO 45

C.....OUTPUT RESULTING ON-BODY POINTS.
   85 DO 90 I=1,NSP
      ZZ=FZTRP(S,Z,SP(I),NS)
      DZ(I)=DZTRP(S,Z,SP(I),NS)
      DZZ=DZTRP(S,DZ,SP(I),NS)
      C(I)= AIMAG(CONJG(DZ(I))*DZZ)/CABS(DZ(I))**3
      X(I)=REAL(ZZ)
   90 Y(I)=AIMAG(ZZ)
      K1=KSTART
      K2=NSP+KSTART-1
      DO 110 I=K1,K2
      II=I-KSTART+1
      XON(I)=X(II)
      YON(I)=Y(II)
      CAPPA(I)=C(II)
      IF(ABS(CAPPA(I)).LT..0001)CAPPA(I)=0.
      IF (REAL(DZ(II)).EQ.0.) GO TO 100
      DYDXO(I)=AIMAG(DZ(II))/REAL(DZ(II))
      IF (ABS(DYDXO(I)).GT.999.) GO TO 100
      IF (ABS(DYDXO(I)).LT..0001) GO TO 95
      ALPHA(I)=ATAN(DYDXO(I))*180./3.14157
      GO TO 105
   95 DYDXO(I)=0.
      ALPHA(I)=0.
      GO TO 105
  100 DYDXO(I)=999.
      ALPHA(I)=90.
  105 SON(I)=0.
      IF(I.NE.1)SON(I)=SON(I-1)+SQRT((XON(I)-XON(I-1))**2+(YON(I)-YON(I-
     1))**2)
```

```
      IF((NSEG.EQ.0.AND.II.EQ.1).OR.(J.EQ.1.AND.II.EQ.1))SON(I)=0.
      IF (I.EQ.K1) GO TO 110
      IF(XON(I).EQ.XON(I-1))CAPPA(I)=CAPPA(I-1)
      IF (XON(I).EQ.XON(I-1)) GO TO 110
      IF((DYDXO(I)-DYDXO(I-1))/(XON(I)-XON(I-1))*CAPPA(I).LT.0.)CAPPA(I)
     1=-CAPPA(I)
      IF(I.EQ.(K1+1))CAPPA(I -1)=SIGN(CAPPA(I-1),CAPPA(I))
      IF(DYDXO(I)*DYDXO(I-1).LT.0..AND.DYDXO(I).GT.0.)CAPPA(I)=-ABS(CAPP
     1A(I))
      IF (I.LT.(K1+2)) GO TO 110
      IF (DYDXO(I)*DYDXO(I-2).LT.0.) GO TO 110
      IF ((DYDXO(I-1).GT.DYDXO(I).AND.DYDXO(I-1).LT.DYDXO(I-2)).OR.(DYDX
     1O(I-1).LT.DYDXO(I).AND.DYDXO(I-1).GT.DYDXO(I-2))) GO TO 110
      IF ((CAPPA(I-1).LE.CAPPA(I).AND.CAPPA(I-1).GE.CAPPA(I-2)).OR.(CAPP
     1A(I-1).GE.CAPPA(I).AND.CAPPA(I-1).LE.CAPPA(I-2))) GO TO 110
      CAPPA(I-1)=-CAPPA(I-1)
  110 CONTINUE
      WRITE (6,115)NS,NSP,DSMAX,X(1),Y(1),X(NSP),Y(NSP)
  115 FORMAT(1H0,7X,
     1            58HDIRECT INTERPOLATION. FULL POINT-SPACING REQUIREMEN
     1TS MET./24X,19HNO. OF INPUT PTS.= ,I4,2X,20HNO. OF OUTPUT PTS.= ,I
     24,2X,16HDSMAX = DSEND = ,F10.2/24X,14HSTART(X,Y) = (,F10.6,1H,,F10
     3.6,1H)/24X,12HEND(X,Y) = (,F10.6,1H,,F10.6,1H))
      IF (DONE) GO TO 120
  120 RETURN
C.....ERROR MESSAGES.
  125 FORMAT(20HSGEN FAILED.  IBAD= ,I3)
  130 WRITE (6,135)
  135 FORMAT(33HSPGEN UNABLE TO COMPLETE SEGMENT )
      STOP
  140 WRITE (6,145)
  145 FORMAT(29HSPGEN UNABLE TO DO EVEN BODY )
      STOP
  150 WRITE (6,155)NSP
  155 FORMAT(44HTOO MANY POINTS FOR BOTH SURFACES.  NLOWER= ,I4)
      STOP
      END
```

Program EOD

```
50.EOD                                                                     25 AUG 75   18
C      OVERLAY (PAN,0,0)                                                                  C
C      PROGRAM MAIN(INPUT=129,OUTPUT,PUNCH=129,TAPE5=INPUT,TAPE6=OUTPUT,                  C
C    1 TAPE7=PUNCH,TAPE1=129,TAPE2=129,TAPE3=129,TAPE4=129,TAPE8=129,                     C
C    2 TAPE9=129,TAPE10=129,TAPE11=129,TAPE12=129,TAPE13=129,TAPE15=129,                  C
C    3 TAPE16=129)                                                                        C
C                                                                                  MAIN  10
C*           ** DOUGLAS PARABOLIC AXISYMMETRIC POTENTIAL FLOW PROGRAM **           MAIN  20
C                                                                                  MAIN  30
C                * CALCULATION OF POTENTIAL FLOW ABOUT BODIES OF                   MAIN  40
C                  REVOLUTION HAVING FLOWS PARALLEL AND PERPENDICULAR              MAIN  50
C                  TO THE AXIS OF REVOLUTION.                                      MAIN  60
C                                                                                  MAIN  70
C                * MAIN PROGRAM                                                    MAIN  80
C                                                                                  MAIN  90
       COMMON /IPSF/ PSF                                                           MAIN 100
        COMMON / NBSAVE / NBOLD, NIN                                               MAIN 110
       COMMON          HEDR(10)   ,CASE       ,NB         ,NNU                     MAIN 130
     1                ,FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07       MAIN 140
     2                ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12       MAIN 150
     3                ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17       MAIN 160
     4                ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22       MAIN 170
     5                ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27       MAIN 180
       COMMON    NT,       ND(11),    MN,         NUNA(5),    TYPEA(5),            MAIN 190
     1           NER1,     NER2,      NMA,        NSIGA,      NSIGC,               MAIN 200
     2           NUNC(5),  TYPEC(5),  NLF(11),    IEC,        NSIGEC,              MAIN 210
     3           TYPEEC(5),NUNEC(5)                                                MAIN 220
       DOUBLE PRECISION  HEDR, CASE                                                MAIN 230
       INTEGER         FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07       MAIN 240
     1                ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12       MAIN 250
     2                ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17       MAIN 260
     3                ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22       MAIN 270
     4                ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27       MAIN 280
         COMMON /P/ IPUVEL                                                         MAIN 290
       COMMON /BLOCK3/NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE,LSSE,SD,MAIN 300
     1 NSMALL                                                                      MAIN 310
       COMMON /BLOCKR/ NRAKES,RNAME(20,9),RAKEA(20),RUNITX(20),                    BAS1 340
     1 RUNITY(20),RDS(20),NRPTS(20),COSTH(20),IRAKE,NOFF,X1R(20),                  BAS1 350
     2 Y1R(20),X2R(20),Y2R(20)                                                     BAS1 360
       COMMON /PRINTF/ PRIN1,PRIN2,PRIN3                                           MTRX 110
       COMMON /ECF/ ECX(500), ECY(500), ECZ(500)                                   MTRX 340
       COMMON /COMBIN/CHAY(2)                                                      AXIS  60
       COMMON /BLOCK5/ X,Y,SINAL,COSAL,HC,M,MM1,MP1,R                              PRB3 100
       COMMON /D/ R1SQR, R2SQR, XMXJ, YMYJ, XMXJP1, YMYJP1, S                      XYZ2  70
       REAL          MN                                                            MAIN 320
C                                                                                  MAIN 330
       CALL TSETV                                                                  MAIN 340
        NBOLD = 0                                                                  MAIN 120
       REWIND 13                                                                   MAIN 350
    10 REWIND 12                                                                   MAIN 360
       REWIND 4                                                                    MAIN 370
       REWIND 3                                                                    MAIN 380
       REWIND 8                                                                    MAIN 390
       REWIND 9                                                                    MAIN 400
       REWIND 10                                                                   MAIN 410
       REWIND 11                                                                   MAIN 420
        REWIND 15                                                                  MAIN 430
```

```
      REWIND 16                                                         MAIN 440
      CALL PART1                                                        MAIN 45I
C     CALL OVERLAY (3HPAN,1,0,6HRECALL)                                        C
      WRITE(6, 20 )T1,NSMALL                                            MAIN 470
   20 FORMAT( 1H1,22H MATRIX FORMATION TOOK, F14.3, 8H SECONDS ,        MAIN 480
     1 /*  (THE NUMBER OF TIMES THAT SMALL ELEMENT FORMULAE WERE USED WAMAIN 490
     2S*,I6,*.)* )                                                      MAIN 500
C*** ***PRESCRIBED VORTICITY IMPLIES TRIANGULARIZATION METHOD OF MATRIX MAIN 510
C*** ***SOLUTION (SOLVIT)                                               MAIN 520
      IF(FLG19.GT.0.OR.FLG13.GT.0)GO TO 30                              MAIN 530
      CALL PART2                                                        MAIN 54I
C     CALL OVERLAY (3HPAN,2,0,6HRECALL)                                        C
      GO TO 50                                                          MAIN 550
   30 CALL PREP                                                         MAIN 56I
C  30 CALL OVERLAY (3HPAN,3,0,6HRECALL)                                        C
      CALL TIMEV(T2)                                                    MAIN 570
      T = T2 - T1                                                       MAIN 580
      WRITE(6, 40 )T                                                    MAIN 590
   40 FORMAT(1H1, 42H MATRIX PREPARATION AND ALL SOLUTIONS TOOK,F14.3,  MAIN 600
     1          8H SECONDS )                                            MAIN 610
   50 CALL PART4                                                        MAIN 62I
C  50 CALL OVERLAY (3HPAN,4,0,6HRECALL)                                        C
      CALL TIMEV(T3)                                                    MAIN 630
      T = T3 - T2                                                       MAIN 640
      WRITE(6, 60 )T                                                    MAIN 650
   60 FORMAT( 1H1, 43H MATRIX SUMMATIONS FOR FINAL SOLUTIONS TOOK,F14.3,MAIN 660
     1          8H SECONDS)                                             MAIN 670
      GO TO 10                                                          MAIN 680
      END                                                               MAIN 690
```

SO.ASINE 25 AUG 75 18

```
1.      FUNCTION ARSIN(X)
2.      ARSIN=ASIN(X)
3.      RETURN
4.      END
```

```
      SUBROUTINE AXIS                                                   AXIS  20
C                                                                       AXIS  10
C                                                                       AXIS  30
C                 * COMPUTE AXISYMMETRIC VELOCITY COMPONENTS AND PRINT  AXIS  40
C                                                                       AXIS  50
      COMMON /COMBIN/CHAY(2)                                            AXIS  60
      COMMON /IPSF/ PSF                                                 AXIS  70
      COMMON      HEDR(10)  ,CASE      ,NB       ,NNU                   AXIS  80
     1            ,FLG03    ,FLG04     ,FLG05    ,FLG06    ,FLG07       AXIS  90
     2            ,FLG08    ,FLG09     ,FLG10    ,FLG11    ,FLG12       AXIS 100
     3            ,FLG13    ,FLG14     ,FLG15    ,FLG16    ,FLG17       AXIS 110
     4            ,FLG18    ,FLG19     ,FLG20    ,FLG21    ,FLG22       AXIS 120
     5            ,FLG23    ,FLG24     ,FLG25    ,FLG26    ,FLG27       AXIS 130
      COMMON   NT,      ND(11),   MN,      NUNA(5),  TYPEA(5),          AXIS 140
     1         NCR1,    NCR2,     NMA,     NSIGA,    NSIGC,             AXIS 150
     2         NUNC(5), TYPEC(5), NLF(11), ICC,      NSIGCC,            AXIS 160
     3         TYPECC(5),NUNCC(5)                                       AXIS 170
      DOUBLE PRECISION  HEDR, CASE                                      AXIS 180
      INTEGER     FLG03     ,FLG04     ,FLG05    ,FLG06    ,FLG07       AXIS 190
     1            ,FLG08    ,FLG09     ,FLG10    ,FLG11    ,FLG12       AXIS 200
     2            ,FLG13    ,FLG14     ,FLG15    ,FLG16    ,FLG17       AXIS 210
     3            ,FLG18    ,FLG19     ,FLG20    ,FLG21    ,FLG22       AXIS 220
     4            ,FLG23    ,FLG24     ,FLG25    ,FLG26    ,FLG27       AXIS 230
      COMMON /P/ IPUVEL                                                 AXIS 240
      REAL        MN                                                    AXIS 250
C                                                                       AXIS 260
      COMMON /C4/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),  AXIS 270
     1              SINA(500),COSA(500),XP(500),  YP(500)               AXIS 280
      COMMON /TC/   RB(500,10),   SIG(500,5),   A(500),   B(500),       AXIS 290
     1              Z(500),       PHI(500,5),   XN(500,5),T(500,5),     AXIS 300
     2              T3(500,5),    NSIG,         NP,       NI,           AXIS 310
     3              SUMV,         SUMM(5)                               AXIS 320
      COMMON /BLOCKR/ NRAKES,RNAME(20,9),RAKEA(20),RUNITX(20),          AXIS 330
     1 RUNITY(20),RDS(20),NRPTS(20),COSTH(20),IRAKE,NOFF,X1R(20),       AXIS 340
     2 Y1R(20),X2R(20),Y2R(20)                                          AXIS 350
C                                                                       AXIS 360
      DIMENSION     VX(500,5),    VY(500,5),    VT(500,5),              AXIS 370
     1              TH(500,5),    CP(500,5),    SUMTOS(5)               AXIS 380
      DIMENSION PVLAST(2)
C                                                                       AXIS 390
      EQUIVALENCE  ( VX(1,1) , XN(1,1) ) , (VY(1,1),T(1,1) ) ,          AXIS 410
     1 ( VT(1,1), T3(1,1) ), ( TH(1,1),SIG(1,1) ), (CP(1,1),T3(1,1) )   AXIS 420
      DATA FOURPI /12.5663706/                                          AXIS 400
C                                                                       AXIS 430
C                 * START                                               AXIS 440
      NC=NT                                                             AXIS 450
      IF (FLG19.GT.0) NC=NMA                                            AXIS 460
      IF (FLG08.EQ.0) GO TO 20                                          AXIS 470
C                 * TITLE FOR MATRIX PRINT                              AXIS 480
      WRITE(6, 290 )HEDR,CASE,PSF                                       AXIS 490
      WRITE (6, 10 )                                                    AXIS 500
   10 FORMAT (1H 43H MATRICES A,B,Z BY ROWS * AXISYMMETRIC FLOW //)     AXIS 510
C                 * READ AXIS SIGMAS                                    AXIS 520
   20 DO 30 N=1,NSIG                                                    AXIS 530
      SUMM(N)=0.0                                                       AXIS 540
      SUMTOS(N)=0.0                                                     AXIS 550
```

```
   30 READ (3) (SIG(1,N),I=1,NC)                                        AXIS 560
      IF (FLG19.LE.C) GO TO 90                                          AXIS 570
      READ (4)                                                          AXIS 580
      NR = NMA+1                                                        AXIS 590
      IF(FLG23 .GT. C)GO TO 40                                          AXIS 600
      READ (4) (SIG(I,1),I=NR,NT)                                       AXIS 610
      REWIND 4                                                          AXIS 620
      GO TO 90                                                          AXIS 630
C                                                                       AXIS 640
C                                                                       AXIS 650
C*** *  RING WING                                                       AXIS 660
C                                                                       AXIS 670
   40 LIFBOD = 0                                                        AXIS 680
      DO 50 K = 1,NP                                                    AXIS 690
      IF( NLF(K) .GT. C)GO TO 50                                        AXIS 700
      LIFBOD = LIFBOD + 1                                               AXIS 710
   50 CONTINUE                                                          AXIS 720
      LBP1 = LIFBOD + 1                                                 AXIS 730
      DO 60 N=1,LBP1                                                    AXIS 740
      DO 60 I=NR,NT                                                     AXIS 750
   60 SIG(I,N) = C.C                                                    AXIS 760
      LBP2 = LBP1 + 1                                                   AXIS 770
      DO 70 N = LBP2,NSIG                                               AXIS 780
   70 READ(4) (SIG(I,N),I=NR,NT)                                        AXIS 790
      I=0
      DO 75 N=LBP2,NSIG
      I = I + 1
75    PVLAST(I)= SIG(NT,N)
C   ***   SIGMAS HERE HAVE BECOME THE INPUT PV                          AXIS 800
      DO 80 N = LBP2,NSIG                                               AXIS 810
      DO 80 I=NR,NT                                                     AXIS 820
   80 SIG(I,N) = SIG(I,N) /(-FOURPI)                                    AXIS 830
      REWIND 4                                                          AXIS 840
C                * NO. OF MIDPOINTS LOOP                                AXIS 850
   90 DO 200 I=1,NT                                                     AXIS 860
C                * READ MATRICES A,B,Z                                  AXIS 870
      READ (9) (A(J),J=1,NT),(B(J),J=1,NT),(Z(J),J=1,NT)                AXIS 880
C                * NO. OF FLOWS LOOP                                    AXIS 890
      N1=0                                                              AXIS 900
      DO 160 N=1,NSIG                                                   AXIS 910
      N1=N1+2                                                           AXIS 920
      SN=0.0                                                            AXIS 930
      ST=0.0                                                            AXIS 940
      SP=0.0                                                            AXIS 950
C                * NO. OF ELEMENTS LOOP                                 AXIS 960
      DO 100 J=1,NT                                                     AXIS 970
      SN=SN+A(J)*SIG(J,N)                                               AXIS 980
      ST=ST+B(J)*SIG(J,N)                                               AXIS 990
      IF(FLG23 .GT. C)Z(J) = 0.0                                        AXIS1000
  100 SP=SP+Z(J)*SIG(J,N)                                               AXIS1010
      IF(FLG22.GT.0) GO TO 150                                          AXIS1020
      IF (FLG12.EQ.0) GO TO 110                                         AXIS1030
      XN(I,N)=SN                                                        AXIS1040
      PHI(I,N)=SP-RB(I,N1-1)                                            AXIS1050
      GO TO 120                                                         AXIS1060
  110 XN(I,N)=SN-RB(I,N1-1)                                             AXIS1070
      PHI(I,N)=SP                                                       AXIS1080
```

```
  120 IF (FLG11.EQ.0) GO TO 130
      T(I,N)=ST
      GO TO 140
  130 T(I,N)=ST+RB(I,N1)
  140 SUMM(N)=SUMM(N)+PHI(I,N)*Y2(I)*RB(I,N1-1)*DELS(I)
      CP(I,N)=1.-T(I,N)**2
      GO TO 160
  150 XN(I,N) = SN
      PHI(I,N) = SP
      T(I,N) = ST
      CP(I,N) = 1.0 - T(I,N)**2
  160 CONTINUE
      IF(FLG08.EQ.0) GO TO 200
      WRITE (6, 170 ) I,(A(J),J=1,NT)
  170 FORMAT (1H0 13H MATRIX A ROW I6/ (1H 10F10.5))
      WRITE (6, 180 ) I,(B(J),J=1,NT)
  180 FORMAT (1H0 13H MATRIX B ROW I6/ (1H 10F10.5))
      WRITE (6, 190 ) I,(Z(J),J=1,NT)
  190 FORMAT (1H0 13H MATRIX Z ROW I6/ (1H 10F10.5))
  200 CONTINUE
      IF (MN.EQ.0.0) GO TO 250
C                 * MACH NO. ADJUSTMENT
      D1=MN*MN
      D2=1.-D1
      D3=SQRT(D2)
      D4=.7*D1
      D5=.2*D1
      DO 210 N=1,NSIG
      DO 210 I=1,NT
      TX=(T(I,N)*COSA(I)-1.)/D2+1.
      TY = ( T(I,N) * SINA(I) ) / D3
      T(I,N)=SQRT(TX*TX+TY*TY)
  210 CP(I,N)=((1.+D5*(1.-T(I,N)**2))**3.5-1.)/D4
C                 * ELIMINATE MACH NO EFFECT FOR PRINTOUT
      DO 220 I=1,NI
  220 X1(I)=X1(I)*D3
      N=0
      J1=0
      DO 240 K=1,NB
      M=N+1
      N=N+ND(K)-1
      DO 230 J=M,N
      J1=J1+1
      T1=X1(J1+1)-X1(J1)
      T2=Y1(J1+1)-Y1(J1)
      X2(J)=(X1(J1+1)+X1(J1))/2.
      DELS(J)=SQRT(T1*T1+T2*T2)
      COSA(J)=T1/DELS(J)
  230 SINA(J)=T2/DELS(J)
  240 J1=J1+1
C                 * PRINT AXIS FLOW (ON-BODY) OUTPUT
  250 DO 450 L=1,NSIG
      KA = L
      IF (FLG16.LE.0) KA=L-1
      IF(FLG22 .GT. 0    .OR. FLG23 .GT. 0 )KA = L
      IF(FLG22.GT.0)GO TO 270
      SUMM(L)=-6.2831853*SUMM(L)
```

```
      DO 260 J = 1, NT                                                  AXIS1660
  260 SUMTDS(L) = SUMTDS(L) + T(J,L)*DELS(J)                            AXIS1670
  270 I = 1                                                             AXIS1680
      J=1                                                               AXIS1690
      M=1                                                               AXIS1700
      N=ND(M)                                                           AXIS1710
      LCTR=22                                                           AXIS1720
  280 WRITE(6, 290 )HEDR,CASE,PSF                                       AXIS1730
  290 FORMAT (1H1 25X, 26HDOUGLAS  AIRCRAFT  COMPANY /                  AXIS1740
     1      28X, 21HLONG  BEACH  DIVISION ///                           AXIS1750
     2  6X,10A6,4X,10HCASE NO.  A6,10H    PSF = ,A4  //)                AXIS1760
      IF (FLG22.GT.0) GO TO 350                                         AXIS1770
      IF (L.GT.1.OR.FLG16.NE.0) GO TO 310                               AXIS1780
      WRITE (6, 300 )                                                   AXIS1790
  300 FORMAT (1H 34H ON-BODY UNIFORM AXISYMMETRIC FLOW )                AXIS1800
      GO TO 370                                                         AXIS1810
  310 IF (TYPEA(KA).GE.0.0) GO TO 330                                   AXIS1820
      WRITE (6, 320 )                                                   AXIS1830
  320 FORMAT (1H 44H FLOW GENERATOR * ROTATING BODY * TYPE ERROR )      AXIS1840
  330 IF (NUNA(KA).EQ.123456) WRITE (6, 340 )                           AXIS1850
  340 FORMAT (27H  ON-BODY STRIP VORTEX FLOW)                           AXIS1860
  350 IF (NUNA(KA).NE.123456) WRITE(6, 360 )NUNA(KA)                    AXIS1870
  360 FORMAT (1H 42H ON-BODY NON-UNIFORM AXISYMMETRIC FLOW NO. I8)      AXIS1880
  370 WRITE (6, 380 )                                                   AXIS1890
  380 FORMAT (1H 5X 24H TRANSFORMED COORDINATES //                      AXIS1900
     1         12X 1HX 13X 1HY 13X          2HTI 12X 2HCP   9X 5HSIN A  AXIS1910
     2        6X 5HCOS A 7X 5HSIGMA 11X 1HN 13X 3HPHI //)               AXIS1920
  390 WRITE (6, 400 ) I,X1(I),Y1(I),X2(J),Y2(J),        T(J,L),CP(J,L),AXIS1930
     1                   SINA(J),COSA(J),SIG(J,L),XN(J,L),PHI(J,L)      AXIS1940
  400 FORMAT (1H I3,2F14.7/ 4X 4F14.7,2F11.5,3F14.7)                    AXIS1950
      I=I+1                                                             AXIS1960
      J=J+1                                                             AXIS1970
      IF (I.EQ.N) GO TO 410                                             AXIS1980
      IF (I.LE.LCTR) GO TO 390                                          AXIS1990
      LCTR=LCTR+22                                                      AXIS2000
      GO TO 280                                                         AXIS2010
  410 M=M+1                                                             AXIS2020
      N=N+ND(M)                                                         AXIS2030
      WRITE (6, 420 ) I,X1(I),Y1(I)                                     AXIS2040
  420 FORMAT (1H I3, 2F14.7 //)                                         AXIS2050
      I=I+1                                                             AXIS2060
      IF ( J - NT ) 390 , 430 , 430                                     AXIS2070
  430 IF(FLG22.GT.0) GO TO 450                                          AXIS2080
      WRITE(6, 440 ) SUMM(L), SUMV, SUMTDS(L)                           AXIS2090
  440 FORMAT (1H0 10X 13H ADDED MASS =F20.7, 4X 9H VOLUME = F20.7,      AXIS
     1         5X 18HSUM (T)(DELTA S) = F20.7 )
  450 CONTINUE                                                          AXIS2120
       IF (IPUVEL .EQ. 0) GO TO 460                                     AXIS2130
      WRITE(6, 720 )                                                    AXIS2140
      LOC = 100                                                         AXIS2150
      CALL PUNCHC (X2, NT, LOC, CASE )                                  AXIS2160
      LOC = 500                                                         AXIS2170
      CALL PUNCHC ( Y2, NT, LOC, CASE )                                 AXIS2180
      LOC = 900                                                         AXIS2190
      CALL PUNCHV ( T, NT, NSIG, LOC, CASE )                            AXIS2200
  460 LL = 1                                                            AXIS2210
      IF(FLG23 .GT. 0)CALL COMBO(LL)                                    AXIS2220
```

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      IF(FLG05 .EQ. 0)RETURN                                          AXIS2230
C                * OFF-BODY POINT                                     AXIS2240
      IF (FLG15.LE.0) GO TO 500                                       AXIS2250
      M = 0                                                           AXIS2260
      DO 470 I = 1, NB                                                AXIS2270
  470 IF (NLF(I) .LE. 0) M = M + 1                                    AXIS2280
      IF ( M .EQ. 0 ) GO TO 500                                       AXIS2290
      MM = NNU + 1                                                    AXIS2300
      IF(FLG23 .GT. 0)MM = MM + NNU                                   AXIS2310
      DO 480 I = 1, MM                                                AXIS2320
  480 READ (4)                                                        AXIS2330
      IF (FLG22.GT.0)READ(4)                                          AXIS2340
      IF(FLG23.GT.0) GO TO 486
      DO 482 J=1,M
482   READ(4)(RB(I,J),I=1,NP),(T3(I,J),I=1,NP)
      GO TO 498
486   IF((FLG05.EQ.1) .AND. (FLG23.EQ.1).AND. (M.EQ.1)) READ (4)
      M1=0
      DO 495 KA=1,NSIG
      IF(NUNA(KA).EQ. 123456) M1=M1+1
495    CONTINUE
      DO 490 J=1,M1
  490 READ(4) (RB(I,J),I = 1,NP), (T3(I,J),I = 1,NP)                 AXIS2360
C  MULTIPLY NOTS ONSET FLOW BY INPUT PV
      J1=M1 - FLG14 + 1
      I=0
      DO 496 J=J1,M1
      I=I+1
      PVSINF=PVLAST(I)
      DO 496 II=1,NP
      RB(II,J) = PVSINF*RB(II,J)
496   T3(II,J)= PVSINF*T3(II,J)
498   REWIND 4                                                        AXIS2370
  500 DO 550 I = 1, NP                                                AXIS2380
      L=0                                                             AXIS2390
C                * READ MATRICES X,Y,Z                                AXIS2400
      READ (9) (A(J),J=1,NT),(B(J),J=1,NT),(Z(J),J=1,NT)              AXIS2410
C                * NO. OF FLOW                                        AXIS2420
      DO 550 N=1,NSIG                                                 AXIS2430
      KA=N                                                            AXIS2440
      IF (FLG16.LE.0) KA=N-1                                          AXIS2450
      SX=0.0                                                          AXIS2460
      SY=0.0                                                          AXIS2470
      SP=0.0                                                          AXIS2480
C                * NO. OF ELEMENTS LOOP                               AXIS2490
      DO 510 J=1,NT                                                   AXIS2500
      SX=SX+A(J)*SIG(J,N)                                             AXIS2510
      SY=SY+B(J)*SIG(J,N)                                             AXIS2520
      IF(FLG23 .GT. 0)Z(J) = 0.0                                      AXIS2530
  510 SP=SP+Z(J)*SIG(J,N)                                             AXIS2540
      PHI(I,N)=SP                                                     AXIS2550
      IF (FLG22.GT.0) GO TO 530                                       AXIS2560
      IF (FLG11.GT.0) GO TO 530                                       AXIS2570
      IF (N.NE.1.OR.FLG16.GT.0) GO TO 520                             AXIS2580
      VX(I,N) = SX+1.                                                 AXIS2590
      GO TO 540                                                       AXIS2600
  520 IF (NUNA(KA).NE.123456) GO TO 530                               AXIS2610
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```
      L=L+1                                                             AXIS2620
      VX(I,N)=SX+RB(I,L)                                                AXIS2630
      VY(I,N)=SY+T3(I,L)                                                AXIS2640
      GO TO 550                                                         AXIS2650
  530 VX(I,N) = SX                                                      AXIS2660
  540 VY(I,N) = SY                                                      AXIS2670
  550 CONTINUE                                                          AXIS2680
      IF (MN.EQ.0.0) GO TO 580                                          AXIS2690
C                * MACH NO. ADJUSTMENT                                  AXIS2700
      DO 560 N=1,NSIG                                                   AXIS2710
      DO 560 I=1,NP                                                     AXIS2720
      VY(I,N)=VY(I,N)/D3                                                AXIS2730
  560 VX(I,N)=(VX(I,N)-1.)/D2+1.                                        AXIS2740
      DO 570 I = 1, NP                                                  AXIS2750
  570 XP(I)=XP(I)*D3                                                    AXIS2760
C                * COMPUTE VT AND THETA                                 AXIS2770
  580 DO 590 N=1,NSIG                                                   AXIS2780
      DO 590 I=1,NP                                                     AXIS2790
      VT(I,N)=SQRT(VX(I,N)**2+VY(I,N)**2)                               AXIS2800
  590 TH(I,N)=ATAN2(VY(I,N),VX(I,N)) * 57.29578                         AXIS2810
C                * PRINT AXIS FLOW (OFF-BODY) OUTPUT                    AXIS2820
      DO 710 L=1,NSIG                                                   AXIS2830
      KA = L                                                            AXIS2840
      IF(FLG16 .LE. 0)KA = L - 1                                        AXIS2850
      IF(FLG22 .GT. 0   .OR.    FLG23 .GT. 0) KA = L                    AXIS2860
      I=1                                                               AXIS2870
      LCTR=43
  600 WRITE(6, 290 )HED9,CASE,PSF                                       AXIS2890
      IF (L.GT.1.OR.FLG16.NE.0) GO TO 620                               AXIS2900
      IF(FLG22.GT.0) GO TO 650                                          AXIS2910
      WRITE (6, 610 )                                                   AXIS2920
  610 FORMAT (1H 35H OFF-BODY UNIFORM AXISYMMETRIC FLOW )               AXIS2930
      GO TO 670                                                         AXIS2940
  620 IF (TYPEA(KA).GE.0.) GO TO 630                                    AXIS2950
      WRITE (6, 320 )                                                   AXIS2960
  630 IF (NUNA(KA).EQ.123456) WRITE (6, 640 )                           AXIS2970
  640 FORMAT (28H  OFF-BODY STRIP VORTEX FLOW)                          AXIS2980
  650 IF (NUNA(KA).NE.123456) WRITE (6, 660 ) NUNA(KA)                  AXIS2990
  660 FORMAT (1H 43H OFF-BODY NON-UNIFORM AXISYMMETRIC FLOW NO. I8)     AXIS3000
  670 WRITE (6, 680 )                                                   AXIS3010
  680 FORMAT (1H 5X, 24H TRANSFORMED COORDINATES //                     AXIS3020
     1           12X 1HX 13X 1HY 13X          2HVX 12X 2HVY 12X 2HVT 10X AXIS3030
     2           5HTHETA 11X 3HPHI //)                                  AXIS3040
  690 WRITE (6, 700 ) I,XP(I),YP(I),         VX(I,L),VY(I,L),VT(I,L),   AXIS3050
     1   TH(I,L), PHI(I,L)                                              AXIS3060
  700 FORMAT (1H I3, 7F14.7)                                            AXIS3070
      I=I+1                                                             AXIS3080
      IF (I.GT.NP) GO TO 710                                            AXIS3090
      IF (I.LE.LCTR) GO TO 690                                          AXIS3100
      LCTR=LCTR+43
      GO TO 600                                                         AXIS3120
  710 CONTINUE                                                          AXIS3130
      IF (IRAKE .EQ. 1) CALL RAKFLO(VX,VY,NSIG)                         AXIS3140
      LL = 0                                                            AXIS3150
      IF(FLG23 .GT. 0)CALL COMBO(LL)                                    AXIS3160
      IF(IPUVEL .EQ. 0)RETURN                                           AXIS3170
      WRITE(6, 720 )                                                    AXIS3180
```

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  720 FORMAT(1H1,88H THE FOLLOWING NUMBERS ARE THE CARD IMAGES THAT GET AXIS3190
     1PUNCHED WHEN THERE IS PUNCHED OUTPUT///)                          AXIS3200
      LOC = 2500                                                        AXIS3210
      CALL PUNCHC ( XP, NP, LOC, CASE )                                 AXIS3220
      LOC = 2900                                                        AXIS3230
      CALL PUNCHC ( YP, NP, LOC, CASE )                                 AXIS3240
      LOC = 3300                                                        AXIS3250
      CALL PUNCHV ( VX, NP, NSIG, LOC, CASE )                           AXIS3260
      LOC = 4900                                                        AXIS3270
      CALL PUNCHV ( VY, NP, NSIG, LOC, CASE )                           AXIS3280
      RETURN                                                            AXIS3290
      END                                                               AXIS3300
```

```
      SUBROUTINE BASIC1                                                 BAS1  20
C                                                                       BAS1  10
C                                                                       BAS1  30
C                 * READ DATA AND SETUP FOR UNIFORM FLOW                BAS1  40
C                                                                       BAS1  50
       COMMON / NBSAVE / NBOLD, NIN                                     BAS1  60
      COMMON /BLOCK1/ IGEOMF(9),ISIGF(9),IPNCHF,NONEW(9)                BAS1  70
      COMMON /BLOCK2/ HCURV(500),HARC(500)                              BAS1  80
      COMMON/CURVRR/ IEL2
      COMMON        HEDR(10)   ,CASE       ,NB         ,NNU             BAS1  90
     1              ,FLG03     ,FLG04      ,FLG05      ,FLG06     ,FLG07 BAS1 100
     2              ,FLG08     ,FLG09      ,FLG10      ,FLG11     ,FLG12 BAS1 110
     3              ,FLG13     ,FLG14      ,FLG15      ,FLG16     ,FLG17 BAS1 120
     4              ,FLG18     ,FLG19      ,FLG20      ,FLG21     ,FLG22 BAS1 130
     5              ,FLG23     ,FLG24      ,FLG25      ,FLG26     ,FLG27 BAS1 140
      COMMON     NT,         ND(11),     MN,        NUNA(5),   TYPECA(5), BAS1 150
     1           NCR1,       NCR2,       NMA,       NSIGA,     NSIGC,    BAS1 160
     2           NUNC(5),    TYPEC(5),  NLF(11),   IEC,       NSIGEC,   BAS1 170
     3           TYPEEC(5),NUNEC(5)                                     BAS1 180
      DOUBLE PRECISION  HEDR, CASE                                      BAS1 190
      INTEGER       FLG03      ,FLG04      ,FLG05      ,FLG06     ,FLG07 BAS1 200
     1              ,FLG08     ,FLG09      ,FLG10      ,FLG11     ,FLG12 BAS1 210
     2              ,FLG13     ,FLG14      ,FLG15      ,FLG16     ,FLG17 BAS1 220
     3              ,FLG18     ,FLG19      ,FLG20      ,FLG21     ,FLG22 BAS1 230
     4              ,FLG23     ,FLG24      ,FLG25      ,FLG26     ,FLG27 BAS1 240
      DIMENSION COSSOR(500), RHS(500)                                   BAS1 250
      REAL          MN                                                  BAS1 260
C                                                                       BAS1 270
      COMMON /CL/    X1(500),   Y1(500),   X2(500),   Y2(500),  DELL(500), BAS1 280
     1               SINA(500),COSA(500),XP(500),   YP(500)             BAS1 290
     2              ,XWAKE(11),YWAKE(11)                                BAS1 300
      COMMON /TL/    TX1(500), TY1(500), NG(500),   TG(500),  ALFA(500), BAS1 310
     1               RSDS(500),DALF(500),                               BAS1 320
     2               CHORD,     TEMP(600),TCNST,     DUMMY(5915)        BAS1 330
      COMMON /BLOCKR/ NRAKES,RNAME(20,9),RAKCA(20),RUNITX(20),          BAS1 340
     1 RUNITY(20),RDS(20),NRPTS(20),COSTH(20),IRAKF,NOFF,X1R(20),       BAS1 350
     2 Y1R(20),X2R(20),Y2R(20)                                          BAS1 360
      DIMENSION UTX1(500),UTY1(500),X(500),Y(500),DELLSQ(500),          BAS1 370
     1 HCURVO(500)                                                      BAS1 380
      EQUIVALENCE (UTX1(1),DUMMY(1)),(UTY1(1),DUMMY(501)),(TX1(1),X(1)),BAS1 390
     1 (TY1(1),Y(1)),(DELLSQ(1),DUMMY(1001)),(HCURVO(1),DUMMY(1501))    BAS1 400
      INTEGER       BON        ,SUBKS                                   BAS1 420
      REAL          MX         ,MY         ,NG                          BAS1 430
      LOGICAL NONEW,NORAKS                                              BAS1 440
      DATA LCMAX/40/
C NOTE ... THE HALF-ARC LENGTH ARRAY (HARC) SHOULD NOT BE CONFUSED WITH BAS1 450
C THE (STRAIGHT LINE) FULL-ELEMENT LENGTH ARRAY (DELL), SINCE THE FIRST BAS1 460
C IS MEASURED ALONG THE ARC WHILE THE SECOND IS NOTHING MORE THAN THE   BAS1 470
C STRAIGHT LINE DISTANCE BETWEEN THE ELEMENT ENDPOINTS. NOTE HT         BAS1 480
C STRAIGHT LINE DISTANCE BETWEEN THE ELEMENT ENDPOINTS. NOTE THAT FOR   BAS1 490
C THE FLAT ELEMENT CASE, THESE DIFFER ONLY BY A FACTOR OF 2. IN SOME    BAS1 500
C ROUTINES (ESP. XYZ, XYZ1, XYZ2) DELL IS CALLED DELS IN COMMON /CL/.   BAS1 510
C                                                                       BAS1 520
C                 * START                                               BAS1 530
      NT=0                                                              BAS1 540
      J1=0                                                              BAS1 550
```

```
      K2=NB
      IELI = 1
       IF( NIN .EQ. 0 )       NIN = 5
      IF ((FLG05.NE.0) .OR. (IRAKF.EQ.1)) K2 = NB + 1
      NORAKS = .TRUE.
      IF (IRAKF .EQ. 1) NORAKS = .FALSE.
      NOFF = 0
C                 * MAJOR LOOP * NO. OF BODIES + OFF BODY POINTS
      LCNT = 0
      DO 510  L=1,K2
      READ (5, 10 ) IGEOMF(L),ISIGF(L),ICURVN,NONEWF,IFORMT,
     1   NN,MX,MY,THETA,ADDX,ADDY
   10 FORMAT(5I1,I5,5F10.0)
      NONEW(L) = .FALSE.
      IF (NONEWF .EQ. 1) NONEW(L) = .TRUE.
      IF ((L.EQ.(NB+1)) .AND. (FLG05.EQ.0)) GO TO 140
      READ (5, 20 ) BON,SUBKS,NLF(L),XE,YE
   20 FORMAT (3(5X,I5),2F10.0)
      ND(L)=NN
      IF (BON .EQ. 0) NOFF = NN
C*** ***ND(L) IS THE NUMBER OF POINTS ON BODY L, OR THE NUMBER OF OFF
C*** ***BODY POINTS FOR L = NB + 1
      IF (BON .EQ. 0) GO TO 30
      M = NN - 1
      IEL2 = IEL1 + M - 1
   30 CONTINUE
      IF (SUBKS) 40 , 70 , 40
   40  IF( L .NE. K2 )        GO TO 60
       NTIMES = NBOLD - NB
       IF( NTIMES .LE. 0 )       GO TO 60
       DO 50  NSKIPS = 1, NTIMES
   50 READ (13)
   60 READ (13) (UTX1(I),I=1,NN),(UTY1(I),I=1,NN)
      GO TO 150
   70 IF (BON.EQ.0) GO TO 100
      IF (FLG07) 80 , 100 , 80
C                 * ELLIPSE GENERATOR FOR X1 AND Y1
   80 IF (XE.EQ.0.0) XE=1.
      IF (YE.EQ.0.0) YE=1.
      EN=M
      DGAM=3.141593  /EN
      GAM=3.141593
      DO 90  I=1,NN
      UTX1(I) = XE*COS(GAM)
      UTY1(I) = YE*SIN(GAM)
   90 GAM=GAM-DGAM
      GO TO 150
C
C                 * READ X1 AND Y1 FROM INPUT CARDS
  100 IF (IFORMT .EQ. 2) GO TO 120
      IF (IFORMT .EQ. 1) GO TO 110
C
C IFORMT=0 ...
       READ (NIN, 710 ) (UTX1(I),I=1,NN)
       READ (NIN, 710 ) (UTY1(I),I=1,NN)
      GO TO 130
C
```

```
C IFORMT=1 ...
  110 READ (NIN, 790 ) (UTX1(I),UTY1(I),I=1,NN)
      GO TO 130
C
C IFORMT=2 ...
  120 READ (NIN, 800 ) (UTX1(I),UTY1(I),I=1,NN)
C
  130 IF (L .NE. (NB+1)) GO TO 150
      IF (IRAKE .NE. 1) GO TO 150
C
C READ IN AUTOMATIC MASS FLOW RAKE GENERATION INFORMATION ...
      READ (5, 20 ) NN
  140 NRAKES = NN
      NI = NOFF + 1
      CALL IRAKES(UTX1(NI),UTY1(NI),NNR)
      NN = NOFF + NNR
      ND(L) = NN
      FLG05 = 1
      BDN = 0
C
C
C INITIALIZE ELEMENT CURVATURE VALUES ...
  150 DO 160 II=IEL1,IEL2
  160 HCURV(II) = 0.0
C
      IF (ICURVN .EQ. 0) GO TO 180
      READ (NIN, 710 ) (HCURV(II),II=IEL1,IEL2)
      DO 170 II=IEL1,IEL2
  170 HCURV(II) = 0.5*HCURV(II)
  180 CONTINUE
C
C** BODIES NO. (NB-FLG14+1) TO (NB) ARE PRESCRIBED VORTICITY BODIES.
C
      IF ( FLG23 .LE. 0  .OR.  (L.LE.NB-FLG14  .OR. L .GT. NB))GO TO 190
C
C*** *  IF CONTROL REACHES THIS POINT, RING WING OPTION IS IN EFFECT AND
C*** *L IS A PRESCRIBED VORTICITY BODY
C   ***  LCNT IS THE RELATIVE NUMBER OF THE WAKE BODY STARTING WITH 1
C
      LCNT = LCNT + 1
      XWAKE(LCNT) = UTX1(NN)
      YWAKE(LCNT) = UTY1(NN)
C                * SAVE X1 AND Y1 FOR SUBCASE
  190 IF (SUBKS.EQ.0) WRITE(13)(UTX1(I),I=1,NN),(UTY1(I),I=1,NN)
C
C CALCULATE TRANSFORMED COORDINATES ...
      DO 200 I=1,NN
      TX1(I) = UTX1(I)
  200 TY1(I) = UTY1(I)
C NOTE THAT (X AND TX1) AND (Y AND TY1) ARE EQUIVALENCED.
C
      IF (HX .EQ. 0.0) GO TO 220
      DO 210 I=1,NN
  210 TX1(I) = TX1(I) * HX
C
  220 IF (HY .EQ. 0.0) GO TO 240
      DO 230 I=1,NN
```

```
  230 TY1(I) = TY1(I) + HY
C
  240 IF (THETA .EQ. 0.0) GO TO 260
      CT = COS(THETA/57.29578)
      ST = SIN(THETA/57.29578)
      DO 250 I=1,NN
      TEMP1 = TX1(I)
      TX1(I) = TEMP1*CT + TY1(I)*ST
  250 TY1(I) = TY1(I)*CT - TEMP1*ST
C
  260 IF (ADDX .EQ. 0.0) GO TO 280
      DO 270 I=1,NN
  270 TX1(I) = TX1(I) + ADDX
C
  280 IF (ADDY .EQ. 0.0) GO TO 300
      DO 290 I=1,NN
  290 TY1(I) = TY1(I) + ADDY
C
  300 IF ((CHORD.EQ.0.0) .OR. (CHORD.EQ.1.0)) GO TO 320
      DO 310 I=1,NN
      TX1(I) = TX1(I) / CHORD
  310 TY1(I) = TY1(I) / CHORD
C
  320 IF (MN .EQ. 0.0) GO TO 340
      BETA = SQRT(1.0 - MN*MN)
      DO 330 I=1,NN,
  330 TX1(I) = TX1(I) / BETA
C
C
  340 NNM1 = NN - 1
      NNM2 = NN - 2
      IF (BDN .EQ. 0) GO TO 450
C
C CALCULATE FLAT ELEMENT LENGTHS,ETC. ...
      DO 350 I=1,NNM1
      II = IEL1 + I - 1
      DELX = X(I+1) - X(I)
      DELY = Y(I+1) - Y(I)
      DELLSQ(I) = DELX*DELX + DELY*DELY
      DELL(II) = SQRT(DELLSQ(I))
      HARC(II) = DELL(II)/2.0
      X2(II) = (X(I) + X(I+1)) / 2.0
      Y2(II) = (Y(I) + Y(I+1)) / 2.0
      COSA(II) = DELX / DELL(II)
      SINA(II) = DELY / DELL(II)
  350 ALFA(I) = ATAN2(DELY,DELX)
C
      DALF(1) = 0.0
      DO 360 I=2,NNM1
  360 DALF(I) = (ALFA(I) - ALFA(I-1)) * 57.29578
      IF (IGEOMF(L) .NE. 0) GO TO 410
      IF (ICURVN .NE. 0) GO TO 390
C
C CALCULATE THE HALF-CURVATURES VALUES OF ALL THE (NN-2) POSSIBLE ARCS.
      DO 370 I=1,NNM2
      II = IEL1 + I - 1
      J = I + 1
```

```
      K = I + 2                                                         BAS12270
      D = 4.0*((X(J)-X(I))*(Y(J)-Y(K))-(X(J)-X(K))*(Y(J)-Y(I)) )        BAS12280
      DH = 2.0*((X(I)*X(I) + Y(I)*Y(I))*(Y(K) - Y(J)) +                 BAS12290
     1 (X(J)*X(J) + Y(J)*Y(J))*(Y(I) - Y(K)) +                          BAS12300
     2 (X(K)*X(K) + Y(K)*Y(K))*(Y(J) - Y(I)) )                          BAS12310
      DK = 2.0*((X(I)*X(I) + Y(I)*Y(I))*(X(J) - X(K)) +                 BAS12320
     1 (X(J)*X(J) + Y(J)*Y(J))*(X(K) - X(I)) +                          BAS12330
     2 (X(K)*X(K) + Y(K)*Y(K))*(X(I) - X(J)) )                          BAS12340
      R = SQRT( (D*X(J)-DH)**2 + (D*Y(J)-DK)**2 )                       BAS12350
      HCURVO(II) = -0.5 * D / R                                         BAS12360
  370 CONTINUE                                                          BAS12370
C                                                                       BAS12380
C NOW COMPUTE THE GEOMETRIC MEANS OVER THE 2 ARCS (EXCEPT FOR THE
C FIRST AND LAST) ...
      HCURV(IEL1) = HCURVO(IEL1)                                        BAS12400
      HCURV(IEL2) = HCURVO(IEL2-1)                                      BAS12410
      DO 380 I=2,NNM2                                                   BAS12420
      II = IEL1 + I - 1                                                 BAS12430
      H1H2 = HCURVO(II-1)*HCURVO(II)
      IF (H1H2 .GT. 0.0) GO TO 385
      HCURV(II) = 0.0
      GO TO 380
C
  385 HCURV(II) = SQRT(H1H2)
      IF (HCURVO(II) .LT. 0.0) HCURV(II) = -HCURV(II)
  380 CONTINUE
C                                                                       BAS12450
C NOW CALCULATE CONTROL POINT LOCATIONS AND HALF-ARC LENGTHS ...        BAS12460
  390 DO 400 I=1,NNM1                                                   BAS12470
      II = IEL1 + I - 1                                                 BAS12480
      ETA0 = -HCURV(II)*DELLSQ(I) / 4.0                                 BAS12490
      X2(II) = X2(II) - ETA0*SINA(II)                                   BAS12500
      Y2(II) = Y2(II) + ETA0*COSA(II)                                   BAS12510
  400 HARC(II) = (DELL(II)/2.)*(1.0 + (HCURV(II)**2)*DELLSQ(I) / 6.0 )  BAS12520
C                                                                       BAS12530
C CAN NOW COMPUTE RUNNING ARC LENGTHS ...                               BAS12540
  410 RSDS(1) = 2.*HARC(IEL1)                                           BAS12550
      DO 420 I=1,NNM2                                                   BAS12560
  420 RSDS(I+1) = RSDS(I) + 2.*HARC(IEL1 + I - 1)                       BAS12570
C                                                                       BAS12580
C PRINT THE RESULTS FOR ON-BODY POINTS ...                              BAS12590
      LC = LCMAX                                                        BAS12600
      DO 440 I=1,NNM1                                                   BAS12610
      II = IEL1 + I - 1                                                 BAS12620
      IF (LC .LT. LCMAX) GO TO 430                                      BAS12630
      LC = 0                                                            BAS12640
      WRITE (6, 720 ) HEDR,NN,MX,MY,THETA,ADDX,ADDY,XE,YE               BAS12650
      IF (IGEOMF(L).EQ.0) WRITE (6, 620 ) IGEOMF(L)                     BAS12660
      IF (IGEOMF(L).NE.0) WRITE (6, 630 ) IGEOMF(L)                     BAS12670
      IF (ISIGF(L).EQ.0) WRITE (6, 640 ) ISIGF(L)                       BAS12680
      IF (ISIGF(L).EQ.1) WRITE (6, 650 ) ISIGF(L)                       BAS12690
      IF (ISIGF(L).GE.2) WRITE(6, 660 ) ISIGF(L)                        BAS12700
      IF (ICURVN.EQ.0) WRITE (6, 670 ) ICURVN                           BAS12710
      IF (ICURVN.NE.0) WRITE (6, 680 ) ICURVN                           BAS12720
      IF (.NOT. NONEW(L)) WRITE (6, 690 )                               BAS12730
      IF(NONEW(L)) WRITE(6,700)
      WRITE(6,760)
```

```
      WRITE(6,730)
  430 WRITE(6,740) I,UTX1(I),UTY1(I),TX1(I),TY1(I)
      CURV = 2.D*HCURV(II)
      ARCL = 2.D*HARC(II)
      WRITE (6, 750 ) X2(II),Y2(II),ARCL     ,RSDS(I),DALF(I),CURV
  440 LC = LC + 2
      WRITE (6, 740 ) NN,UTX1(NN),UTY1(NN),TX1(NN),TY1(NN)
C
      GO TO 490
C
C PRINT RESULTS FOR OFF-BODY POINTS ...
  450 LC = LCMAX
      IRAKE = 1
      IRPT = 0
      DO 473 I=1,NN
      IF (LC .LT. LCMAX) GO TO 460
      LC = 0
      WRITE (6, 720 ) HCDR,NN,MX,MY,THETA,ADDX,ADDY,XE,YE
      WRITE (6, 770 )
      WRITE (6, 780 )
  460 WRITE (6, 740 ) I,UTX1(I),UTY1(I),TX1(I),TY1(I)
      IF (NORAKS) GO TO 470
C
      IF (I .LE. NOFF) GO TO 470
C THIS MUST BE ANOTHER RAKE POINT ...
      IF (IRPT .EQ. 0) WRITE (6, 810 ) (RNAME(IRAKE,II),II=1,9)
      IRPT = IRPT + 1
      IF (IRPT .LT. NRPTS(IRAKE)) GO TO 470
      IRAKE = IRAKE + 1
      IRPT = 0
C
  470 LC = LC + 1
C
C
      DO 480 I=1,NN
      XP(I)=TX1(I)
  480 YP(I)=TY1(I)
      WRITE (12) (XP(I),I=1,NN),(YP(I),I=1,NN)
      GO TO 510
C
C
  490 DO 500 I=1,NN
      J1 = J1 + 1
      X1(J1) = TX1(I)
  500 Y1(J1) = TY1(I)
      NT = NT + M
      IEL1 = IEL2 + 1
  510 CONTINUE
      WRITE(7,222) CASE,FLG15,IGEOMF(1),ISIGF(1),ICURVN,NONEWF
  222 FORMAT(A6,5I1)
      REWIND 13
      IF (FLG14.LE.0) GO TO 580
      IF (FLG14.LE.NB) GO TO 530
      WRITE (6, 520 )
  520 FORMAT (45HIVALUE OF FLG14 EXCEEDS NO. OF BODIES.  STOP. )
      STOP
  530 IF (FLG14.NE.NB) GO TO 540
```

```
      NMA=0                                                             BAS13310
      GO TO 560                                                         BAS13320
  540 L = NB-FLG14                                                      BAS13330
      NMA = -L                                                          BAS13340
      DO 550  I = 1, L                                                  BAS13350
C*** ***NMA BECOMES THE NUMBER OF ELEMENTS ON THE 1ST L BODIES (IE THOSEBAS13360
C*** ***NOT HAVING AN INPUT VORTICITY OR VELOCITY)                      BAS13370
  550 NMA = NMA + ND(I)                                                 BAS13380
C*** ***NR BECOMES THE NUMBER OF ELEMENTS RECEIVING AN INPUT VORTICITY  BAS13390
C*** ***OR VELOCITY                                                     BAS13400
  560 NR = NE-NMA                                                       BAS13410
      IF (ICNST.GT.0.)GO TO 580                                         BAS13420
      DO 570  I = 1,NR,6                                                BAS13430
      READ (5, 710 ) TG(I),TG(I+1),TG(I+2),TG(I+3),TG(I+4),TG(I+5)      BAS13440
  570 CONTINUE                                                          BAS13450
  580 CONTINUE                                                          BAS13460
C                       * SAVE PARAMETERS                               BAS13470
      WRITE (12) (X1(I),I=1,J1),(Y1(I),I=1,J1),(X2(I),I=1,NT)           BAS13480
     1           ,(Y2(I),I=1,NT),(DELL(I),I=1,NT)                       BAS13490
      REWIND 12                                                         BAS13500
C                       * SAVE SINA AND COSA ON TAPE 4 FOR CALC. OF MATRIX   BAS13510
C                         SOLUTION (RIGHT HAND MATRIX)                  BAS13520
      WRITE (4)  (SINA(I),I=1,NT),(COSA(I),I=1,NT)                      BAS13530
      IF ( FLG14) 600 , 600 , 590                                       BAS13540
  590 IF (ICNST.GT.0.0) WRITE(4) (ICNST,I=1,NR)                         BAS13550
      IF (ICNST.LE.0.) WRITE(4) (TG(I), I=1,NR)                         BAS13560
  600 IF (FLG22.LE.0) RETURN                                            BAS13570
      NPB1 = ND(1) - 1                                                  BAS13580
      DO 610  I = 1,NPB1                                                BAS13590
      COSSQR(I) = COSA(I)**2                                            BAS13600
  610 RHS(I) = 2.0 * ABS( SINA(I) * COSA(I) )                           BAS13610
      WRITE(4) ( COSSQR(I),I=1,NPB1), (RHS(I),I = 1,NPB1)               BAS13620
      RETURN                                                            BAS13630
  620 FORMAT(24HOCURVED ELEMENTS(IGEOMF=,I1,1H) )                       BAS13640
  630 FORMAT(22HOFLAT ELEMENTS(IGEOMF=,I1,1H) )                         BAS13650
  640 FORMAT(1H+,30X,43HPIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=,I1, BAS13660
     1 1H) )                                                            BAS13670
  650 FORMAT(1H+,30X,40HPIECEWISE-LINEAR SOURCE DENSITIES(ISIGF=,I1,1H))BAS13680
  660 FORMAT(1H+,30X,42HPIECEWISE-CONSTANT SOURCE DENSITIES(ISIGF=,I1,  BAS13690
     1 1H) )                                                            BAS13700
  670 FORMAT(1H+,80X,46HINTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=, BAS13710
     1 I1,1H) )                                                         BAS13720
  680 FORMAT(1H+,80X,37HUSER-INPUT ELEMENT CURVATURES(ICURVN=,I1,1H)  ) BAS13730
  690 FORMAT(32H NEW VELOCITY FORMULAE ARE USED. )                      BAS13740
  700 FORMAT(32H OLD VELOCITY FORMULAE ARE USED. )                      BAS13750
710   FORMAT(6E13.8)
  720 FORMAT ( 1H1 25X 26HDOUGLAS  AIRCRAFT  COMPANY /                  BAS13770
     1            28X 21HLONG  BEACH  DIVISION //  5X 10A6 //
     2             8X 4HNN = I4, 15X 4HMX = F13.7, 4X 4HMY = F13.7 /    BAS13790
     3             5X 7HTHETA = F13.7, 4X 6HADDX = F13.7, 2X 6HADDY =F13.7/BAS13800
     4             8X 4HXE = F13.7, 6X 4HYE = F13.7 )                   BAS13810
  730 FORMAT(1H ,6X,41H***UNTRANSFORMED***    *** TRANSFORMED ***,/1H , BAS1382
     1 11X,1HX,10X,1HY,10X,1HX,10X,1HY,7X,6HX C.P.,5X,6HY C.P.,5X,      BAS13830
     2 7HDELTA S,5X,5HSUMDS,5X,7HD ALPHA,3X,9HCURVATURE/ )
  740 FORMAT(1H ,I4,4F11.5)                                             BAS13850
  750 FORMAT(1H ,48X,6F11.5)                                            BAS13860
  760 FORMAT(1HO,9X,37HO N - B O D Y   C O O R D I N A T E S)           BAS13870
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      770 FORMAT(1H0,7X,39H0 F F - B O D Y   C O O R D I N A T E S)     BAS13880
      780 FORMAT(1H0,6X,41H***UNTRANSFORMED***   *** TRANSFORMED ***,/1H ,  BAS13890
         1 11X,1HX,10X,1HY,10X,1HX,10X,1HY,//)                             BAS13900
      790 FORMAT(2F10.5)                                                    BAS13910
      800 FORMAT(F10.5,10X,F10.5)                                           BAS13920
      810 FORMAT(1H+,55X,8A4,A3)                                            BAS13930
          END                                                               BAS13940
```

```
      SUBROUTINE BASIC2
C
C
C                  * READ DATA AND SETUP FOR NON-UNIFORM FLOWS
C
      COMMON / NESAVE / NBOLD, NIN
      COMMON      HEDR(10)  ,CASE       ,NB         ,NNU
     1                ,FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2                ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3                ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4                ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5                ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COMMON     NT,         ND(11),     MN,        NUNA(5),  TYPEA(5),
     1           NER1,       NER2,       NMA,       NSIGA,    NSIGC,
     2           NUNC(5),    TYPEC(5),   NLF(11),   ICC,      NSIGEC,
     3           TYPEEC(5),NUNEC(5)
      DOUBLE PRECISION  HEDR, CASE
      INTEGER     FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1           ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2           ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3           ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4           ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
      REAL        MN
C
      COMMON /CL/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
     2             ,XWAKE(11),YWAKE(11)
      COMMON /TL/   TX1(500), TY1(500), NG(500),  TG(500),  ALFA(500),
     1              RSDS(500),DALF(500),
     2              CHORD,    TEMP(600),TCNST,    DUMMY(5915)
      INTEGER     BDN
      REAL        MX         ,MY         ,NG
C
C                  * START
C                  * SETS OF NON-UNIFORM FLOW LOOP
      NSIGEC = 0
      KA=0
      KC=0
      KEC = 0
       IF( NIN .EQ. 0 )         NIN = 5
      DO 170  L=1,NNU
      READ (5, 10 ) NUN,MSF,TYPE,FG
   10 FORMAT ( 2(5X I5), 2F10.0)
      IF (MSF.EQ.1.OR.MSF.EQ.2.OR.MSF.EQ.5) GO TO 20
      KA=KA+1
      NSIGA=NSIGA+1
      NUNA(KA)=NUN
      TYPEA(KA)=TYPE
   20 IF (MSF.EQ.0.OR.MSF.EQ.2.OR.MSF.EQ.4) GO TO 30
      KC=KC+1
      NSIGC=NSIGC+1
      NUNC(KC)=NUN
      TYPEC(KC)=TYPE
   30 IF (MSF.LT.2.OR.MSF.EQ.3) GO TO 40
      KEC = KEC + 1
      NSIGEC = NSIGEC + 1
```

```
      NUNEC(KEC) = NUN                                                  BAS2 570
      TYPEEC(KEC) = TYPE                                                BAS2 580
   40 IF (TYPE) 50 , 70 , 70                                            BAS2 590
C                 * COMPUTED TYPE                                       BAS2 600
   50 DO 60 I=1,NT                                                      BAS2 610
      NG(I)=Y2(I)                                                       BAS2 620
   60 TG(I)=FG-X2(I)                                                    BAS2 630
      GO TO 110                                                         BAS2 640
C                 * (X,Y) OR (N,T) TYPE * READ INPUT                    BAS2 650
   70 DO 90 I=1,NT,6                                                    BAS2 660
      READ(NIN, 80 )NG(I),NG(I+1),NG(I+2),NG(I+3),NG(I+4),NG(I+5)       BAS2 670
   80 FORMAT ( 6F10.0)                                                  BAS2 680
   90 CONTINUE                                                          BAS2 690
      DO 100 I=1,NT,6                                                   BAS2 700
      READ(NIN, 80 )TG(I),TG(I+1),TG(I+2),TG(I+3),TG(I+4),TG(I+5)       BAS2 710
  100 CONTINUE                                                          BAS2 720
  110 IF (TYPE) 120 , 140 , 120                                         BAS2 730
  120 DO 130 I = 1, NT                                                  BAS2 740
      T1=NG(I)                                                          BAS2 750
      NG(I)= T1*SINA(I)-TG(I)*COSA(I)                                   BAS2 760
  130 TG(I)= T1*COSA(I)+TG(I)*SINA(I)                                   BAS2 770
C                 * WRITE BASIC DATA OUTPUT                             BAS2 780
  140 WRITE (6, 150 ) HEDR,MSF,TYPE,FG,NUN,(NG(I),I=1,NT)               BAS2 790
  150 FORMAT ( 1H1 25X 26HDOUGLAS  AIRCRAFT  COMPANY /                  BAS2 800
     1          28X, 21HLONG  BEACH  DIVISION /// 5X 10A6 //            BAS2 810
     2          6X 5HMSF = I4, 10X 6HTYPE = F10.4, 10X 4HFG = F13.7 /   BAS2 820
     3           1H0, 4X, 20HNON-UNIFORM FLOW NO.I6 /                   BAS2 830
     4           1H0, 4X, 10HLIST OF NG// (1H 6F14.7))                  BAS2 840
      WRITE (6, 160 ) (TG(I), I = 1, NT)                                BAS2 850
  160 FORMAT (1H0 4X 10HLIST OF TG // (1H 6F14.7))                      BAS2 860
      WRITE (4) MSF,(NG(I),I=1,NT),(TG(I),I=1,NT)                       BAS2 870
  170 CONTINUE                                                          BAS2 880
      RETURN                                                            BAS2 890
      END                                                               BAS2 900
```

```
      SUBROUTINE COEFF(J1,L)
C
C
C THIS ROUTINE CALCULATES THE MATRIX COMBINATION CONSTANTS FOR THE
C LINEAR-, OR QUADRATIC-SOURCE DENSITIES.
C
      COMMON /BLOCK2/ HCURV(500),HARC(500)
      COMMON /BLOCK4/A11(500),A12(500),A13(500),A21(500),A22(500),
     1A23(500)
      DIMENSION D(500),E(500),F(500),G(500),H(500),I(500),SP(500)
      EQUIVALENCE (SP(1),HARC(1))
      REAL I
C
C
C FOR FIRST ELEMENT ...
      J2 = J1 + 1
      J3 = J2 + 1
      SUM13 = SP(J1) + SP(J3)
      SUM12 = SP(J1) + SP(J2)
      SUM23 = SP(J2) + SP(J3)
      BRAC = SP(J2) + 0.5*(SP(J1)+SP(J3))
      A = -(SUM12 + 0.5*SUM23)/(SUM12*BRAC)
      B = 2.0*(SP(J2) + 0.5*SUM13)/(SUM12*SUM23)
      C = -0.5*SUM12/(SUM23*BRAC)
C
C FOR LAST ELEMENT ...
      LM1 = L - 1
      LM2 = L - 2
      SUM01 = SP(L) + SP(LM1)
      SUM02 = SP(L) + SP(LM2)
      SUM12 = SP(LM1) + SP(LM2)
      BRAC = SP(LM1) + 0.5*SUM02
      X = 0.5*SUM01/(SUM12*BRAC)
      Y = -2.0*BRAC/(SUM12*SUM01)
      Z = (SUM01+0.5*SUM12)/(SUM01*BRAC)
C
C FOR THE OTHER ELEMENTS ...
      DO 10 J=J2,LM1
      JM1 = J - 1
      JP1 = J + 1
      SUM1 = SP(J) + SP(JP1)
      SUM2 = SP(J) + SP(JM1)
      BRAC = 2.0*(SP(J) + 0.5*(SP(JM1)+ SP(JP1)) )
      FRAC = SUM1/SUM2
      D(J) = -FRAC/BRAC
      E(J) = (FRAC-1./FRAC)/BRAC
      F(J) = 1.0/(FRAC*BRAC)
      G(J) = 1.0/(BRAC*SUM2)
      H(J) = -1.0/(SUM2*SUM1)
   10 I(J) = 1.0/(BRAC*SUM1)
C
C NOW, STORE THESE IN THE APPROPRIATE LOCATIONS WITHIN THE COMMON BLOCK
      A11(J1) = A
      A11(L) = X
      A12(J1) = B
      A12(L) = Y
```

```
      A13(J1) = C
      A13(L) = Z
      A21(J1) = G(J2)
      A21(L) = G(LM1)
      A22(J1) = H(J2)
      A22(L) = H(LM1)
      A23(J1) = I(J2)
      A23(L) = I(LM1)
      DO 20 J=J2,LM1
      A11(J) = D(J)
      A12(J) = E(J)
      A13(J) = F(J)
      A21(J) = G(J)
      A22(J) = H(J)
   20 A23(J) = I(J)
C
C
      RETURN
C
      END
```

```
      SUBROUTINE COMBO(LL)
C
C
      COMMON / IPSF /  PSF
      COMMON /COMBIN/CHAY(2)
      COMMON       HEDR(10)  ,CASE       ,NB         ,NNH
     1                ,FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2                ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3                ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4                ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5                ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COMMON   NT,        ND(11),    MN,        NUNA(5),   TYPEA(5),
     1         NER1,      NER2,      NMA,       NSIGA,     NSIGC,
     2         NUNC(5),   TYPEC(5),  NLF(11),   IEC,       NSIGEC,
     3         TYPEEC(5),NUNEC(5)
      DOUBLE PRECISION  HEDR, CASE
      INTEGER         FLG03       ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1                ,FLG08      ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2                ,FLG13      ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3                ,FLG18      ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4                ,FLG23      ,FLG24      ,FLG25      ,FLG26      ,FLG27
      REAL            MN
C
      COMMON /C4/    X1(500),   Y1(500),   X2(500),   Y2(500),   DELS(500),
     1               SINA(500),COSA(500),XP(500),     YP(500)
      COMMON /TC/    RB(500,10),     SIG(500,5),      A(500),    B(500),
     1               Z(500),         PHI(500,5),      XN(500,5),T(500,5),
     2               T3(500,5),      NSIG,            NP,        NI,
     3               SUMV,           SUMM(5)
      DIMENSION C(2,2), DV(2),         TFIRST(2,5),TLAST(2,5),TSUM(2,5)
      DIMENSION  CP(500)
      EQUIVALENCE ( CP(1),A(1) )
      EQUIVALENCE (  DV(1),CHAY(1)   )
      DIMENSION VX(500,5),VY(500,5),VT(500,5)
      EQUIVALENCE  (VX(1,1),XN(1,1)),(VY(1,1),T(1,1)),
     1   (VT(1,1),T3(1,1))
C
C  **   ICNT WILL BE THE NUMBER OF LIFTING BODIES
C  *   NFLOW WILL BE THE NUMBER OF FLOWS
C
      ICNT = 0
      DO 10 K=1,NP
   10 IF( NLF(K) .LE. 0)ICNT=ICNT+1
      NFLOW = 1 + 2*ICNT
      IF(LL .EQ. 0)GO TO 230
      READ(5, 20 )( DV(I),I=1,ICNT )
   20 FORMAT (6F10.0)
      WRITE(6, 30 ) (DV(I),I=1,ICNT)
   30 FORMAT(1H1,42H THE INPUT DV FOR COMBINATION SOLUTION  ARE /
     1  (2X,6F10.4)   )
C
C   ***   IPTCNT WILL BE THE LAST MIDPOINT ON BODY K
C
      IPTCNT = 0
C  *   ILIFT WILL BE THE LIFTING BODY NUMBER
      ILIFT = 0
```

```
      DO 50  K=1,NB
      IPTCNT = IPTCNT + ND(K) - 1
      IFIRST = IPTCNT - ND(K) + 2
      IF ( NLF(K) .GT. 0 )GO TO 50
      ILIFT = ILIFT + 1
C
      DO 40 J=1,NFLOW
      TFIRST(ILIFT,J) = T(IFIRST,J)
      TLAST(ILIFT,J) = T(IPTCNT,J)
   40 TSUM(ILIFT,J) = TFIRST(ILIFT,J) + TLAST(ILIFT,J)
   50 CONTINUE
C
C  **   IPVBOD WILL BE 1ST PRESCRIBED VORTICITY FLOW
C  *    LASTSV WILL BE LAST STRIP VORTEX FLOW
C
      IPVBOD = 2+ICNT
      LASTSV = IPVBOD - 1
      DO 80  I=1,ICNT
      JCNT = 0
      DV(I)= DV(I) - TSUM(I,1)
C
      DO 60  J=IPVBOD,NFLOW
   60 DV(I) = DV(I) - TSUM(I,J)
C
      DO 70  J=2,LASTSV
      JCNT = JCNT + 1
   70 C(I,JCNT) = TSUM(I,J)
   80 CONTINUE
C
C
      CALL SOLCOM( DV, C, ICNT )
      DO 110 I = 1,NT
C   ***   ADD PV FLOWS TO AXIS FLOW FOR COMBINATION SOLUTION   ON BODY
      JCNT = 0
      DO 90  J=IPVBOD,NFLOW
      XN(I,1) = XN(I,1) + XN(I,J)
   90 T(I,1) = T(I,1) + T(I,J)
C   ***   ADD K * STRIP VORTEX BODY VELOCITY FOR COMBINATION SOLUTION
      DO 100 J = 2,LASTSV
      JCNT = JCNT + 1
      XN(I,1) = XN(I,1) + CHAY(JCNT)* XN(I,J)
  100 T(I,1) = T(I,1) + CHAY(JCNT)*T(I,J)
      CP(I) = 1.0  - T(I,1)**2
  110 CONTINUE
      I=1
      J=1
      M=1
      N=ND(M)
      LCTR = 22
  120 WRITE(6, 130 )HEDR,CASE,PSF
  130 FORMAT(1H1,25X, 26HDOUGLAS  AIRCRAFT  COMPANY /
     1       28X, 21HLONG  BEACH  DIVISION ///
     2 6X,10A6, 4X,10HCASE NO.  A6, 9H   PSF = ,A4  // )
      WRITE(6, 140 )
  140 FORMAT( 1H ,21H COMBINATION SOLUTION  )
      WRITE(6, 150 )
  150 FORMAT(1H 5X 24H TRANSFORMED COORDINATES //
```

```
     1 12X,1HX 13X 1HY 13X 2HT1 12X 2HCP 9X 5HSIN A 6X 5HCOS A 11X 1HN  CMB01140
     2 // )                                                             CMB01150
  160 WRITE(6, 170 )I,X1(I),Y1(I),X2(J),Y2(J),T(J,1),CP(J),SINA(J),COSA(CMB01160
     1J)          ,XN(J,1)                                              CMB01170
  170 FORMAT(1H I3,2F14.7 / 4X 4F14.7,2F11.5,F14.7 )                    CMB01180
      I=I+1                                                             CMB01190
      J=J+1                                                             CMB01200
      IF( I  .EQ. N) GO TO 180                                          CMB01210
      IF( I  .LE. LCTR ) GO TO 160                                      CMB01220
      LCTR = LCTR + 22                                                  CMB01230
      GO TO 120                                                         CMB01240
  180 M=M+1                                                             CMB01250
      N=N+ND(M)                                                         CMB01260
      WRITE(6, 190 )I,X1(I),Y1(I)                                       CMB01270
  190 FORMAT( 1H ,I3, 2F14.7 // )                                       CMB01280
      I=I+1                                                             CMB01290
      IF( J .LT. NT)GO TO 160                                           CMB01300
      M1 = 0                                                            CMB01310
      N1 = 0                                                            CMB01320
      DO 220 K = 1,NB                                                   CMB01330
      M1 = N1 + 1                                                       CMB01340
      N1 = N1 + ND(K) - 1                                               CMB01350
      CIRC = 0.0                                                        CMB01360
      THRUST = 0.0                                                      CMB01370
      DO 200 I = M1,N1                                                  CMB01380
      CIRC = CIRC + ( T(I,1) * DELS(I) )                                CMB01390
  200 THRUST = THRUST + ( Y2(I) * CP(I) * SINA(I) * DELS(I) ) .         CMB01400
      THRUST = -6.283186 * THRUST                                       CMB01410
      WRITE(6, 210 )K,CIRC,THRUST                                       CMB01420
  210 FORMAT(///13H    BODY NO. ,I4,5X,14HCIRCULATION = ,F14.7,5X,      CMB01430
     1      9HTHRUST = ,F14.7)                                          CMB01440
  220 CONTINUE                                                          CMB01450
      RETURN                                                            CMB01460
C    ***   OFF BODY COMBINATION SOLUTION                                CMB01470
  230 IPVBOD = 2 + ICNT                                                 CMB01480
      LASTSV = IPVBOD - 1                                               CMB01490
      DO 260  I=1,NP                                                    CMB01500
      JCNT = 0                                                          CMB01510
C    ***   ADD PV FLOWS TO AXIS FLOW FOR COMBINATION SOLUTION   OFF BODY CMB01520
      DO 240  J = IPVBOD,NFLOW                                          CMB01530
      VX(I,1) = VX(I,1) + VX(I,J)                                       CMB01540
  240 VY(I,1) = VY(I,1) + VY(I,J)                                       CMB01550
C    ***   ADD K * STRIP VORTEX OFF BODY VELOCITY                       CMB01560
      DO 250  J=2,LASTSV                                                CMB01570
      JCNT = JCNT + 1                                                   CMB01580
      VX(I,1) = VX(I,1) + CHAY(JCNT) * VX(I,J)                          CMB01590
  250 VY(I,1) = VY(I,1) + CHAY(JCNT) * VY(I,J)                          CMB01600
      VT(I,1) = SQRT( VX(I,1)**2 + VY(I,1)**2 )                         CMB01610
  260 CONTINUE                                                          CMB01620
      I = 1                                                             CMB01630
      LCTR = 45                                                         CMB01640
  270 WRITE(6, 130 )HEDR,CASE,PSF                                       CMB01650
      WRITE(6, 280 )                                                    CMB01660
  280 FORMAT(1H ,31H COMBINATION SOLUTION  OFF BODY   )                 CMB01670
      WRITE(6, 290 )                                                    CMB01680
  290 FORMAT(1H ,5X,24H TRANSFORMED COORDINATES //                      CMB01690
     1   12X,1HX,13X,1HY,13X,2HVX,12X,2HVY,12X,2HVT //)                 CMB01700
```

```
  300 WRITE(6, 310 )I,XP(I),VP(I),VX(I,1),VY(I,1),VT(I,1)
  310 FORMAT(1H ,I3,5F14.7)
      I = I + 1
      IF(I .GT. NP)GO TO 320
      IF(I .LE. LCTR )GO TO 300
      LCTR = LCTR + 45
      GO TO 270
  320 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE CROSS
C
C
C                * COMPUTE CROSS FLOW VELOCITY COMPONENTS AND PRINT
C
      COMMON /IPSF/ PSF
      COMMON        HEDR(10)   ,CASE       ,NB         ,NNU
     1              ,FLG03     ,FLG04      ,FLG05      ,FLG06      ,FLG07
     2              ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     3              ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     4              ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     5              ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COMMON   NT,        ND(11),    MN,        NUNA(5),   TYPEA(5),
     1           NER1,      NER2,      NMA,       NSIGA,     NSIGC,
     2           NUNC(5),   TYPEC(5),  NLF(11),   IEC,       NSIGEC,
     3           TYPEEC(5),NUNEC(5)
      DOUBLE PRECISION  HEDR, CASE
      INTEGER       FLG03      ,FLG04      ,FLG05      ,FLG06      ,FLG07
     1              ,FLG08     ,FLG09      ,FLG10      ,FLG11      ,FLG12
     2              ,FLG13     ,FLG14      ,FLG15      ,FLG16      ,FLG17
     3              ,FLG18     ,FLG19      ,FLG20      ,FLG21      ,FLG22
     4              ,FLG23     ,FLG24      ,FLG25      ,FLG26      ,FLG27
      COMMON /P/ IPUVEL
      REAL          MN
C
      COMMON /C4/    X1(500),   Y1(500),   X2(500),   Y2(500),   DELS(500),
     1               SINA(500),COSA(500),XP(500),    YP(500)
      COMMON /TC/    RB(500,10),     SIG(500,5),     A(500),     B(500),
     1               Z(500),         PHI(500,5),     XN(500,5),T(500,5),
     2               T3(500,5),      NSIG,           NP,         NI,
     3               SUMV,           SUMH(5)
C
      DIMENSION VX(500,5),VY(500,5),V2(500,5),T2(500,5)
C
      EQUIVALENCE ( VX(1,1), XN(1,1) ), ( VY(1,1), T(1,1) ),
     1   (V2(1,1), T3(1,1) ),  (T2(1,1), T(1,1) )
C
C                * START
      IF (FLG08.EQ.0) GO TO 20
C                * TITLE FOR MATRIX PRINT
      WRITE(6, 190 )HEDR,CASE,PSF
      WRITE (6, 10 )
   10 FORMAT (1H 36H MATRICES A,B,Z BY ROWS * CROSS FLOW //)
C                * READ CROSS SIGMAS
   20 DO 30 N=1,NSIG
      SUMH(N)=0.0
   30 READ (3) (SIG(I,N),I=1,NT)
C                * NO. OF MIDPOINTS LOOP
      DO 160 I=1,NT
C                * READ MATRICES A,B,Z
      READ (10) (A(J),J=1,NT),(B(J),J=1,NT),(Z(J),J=1,NT)
C                * NO. OF FLOWS LOOP
      M=0
      DO 120 N=1,NSIG
      M=M+2
      SA=0.0
```

```
      SB=0.0
      SZ=0.0
C                  * NO. OF ELEMENTS LOOP
      DO 40 J=1,NT
      SA=SA+A(J)*SIG(J,N)
      SB=SB+B(J)*SIG(J,N)
   40 SZ=SZ+Z(J)*SIG(J,N)
C                  * INITIALIZE UNIFORM OR NON-UNIFORM PARAMETERS
      IF (FLG21.GT.0) GO TO 60
      IF (N.EQ.1.AND.FLG17.LE.0) GO TO 50
      C1=RB(I,M)
      C2 = -RB(I,M-1)
      C3=0.0
      GO TO 70
   50 C1=SINA(I)
      C2=COSA(I)
      C3=1.
      GO TO 70
   60 C1 = 0.0
      C2 = 0.0
      C3 = 0.0
   70 IF (FLG12.EQ.0) GO TO 80
C                  * OPTION FOR Z (PHI) MATRIX SOLUTION
      XN(I,N) = SA
      PHI(I,N) = Y2(I) * SZ
      GO TO 90
C                  * REGULAR A MATRIX SOLUTION
   80 PHI(I,N)=Y2(I)*SZ
      XN(I,N)=SA+C2
   90 IF (FLG11.EQ.0) GO TO 100
C                  * OPTION PERTURBATIONS
      T2(I,N)=SB
      T3(I,N)=SZ
      GO TO 110
  100 T2(I,N)=SB+C1
      T3(I,N)=SZ+C3
  110 IF(FLG21.GT.0) GO TO 120
      SUMM(N) = SUMM(N) + PHI(I,N) * Y2(I) * C2 * DELS(I)
  120 CONTINUE
      IF (FLG08.EQ.0) GO TO 160
      WRITE (6, 130 ) I,(A(J),J=1,NT)
  130 FORMAT (1H0 13H MATRIX A ROW I6/  (1H 10F10.5))
      WRITE (6, 140 ) I,(B(J),J=1,NT)
  140 FORMAT (1H0 13H MATRIX B ROW I6/ (1H 10F10.5))
      WRITE (6, 150 ) I,(Z(J),J=1,NT)
  150 FORMAT (1H0 13H MATRIX Z ROW I6/ (1H 10F10.5))
  160 CONTINUE
C                  * PRINT CROSS FLOW (ON-BODY) OUTPUT
      DO 330 L=1,NSIG
      KC = L
      IF (FLG17.LE.0) KC=L-1
      IF(FLG21.GT.0) GO TO 170
      SUMM(L) = 3.141593  *SUMM(L)
  170 I = 1
      J=1
      M=1
      N=ND(M)
```

```
      LCTR=22                                                           CROS1140
  180 WRITE(6, 190 )HEDR,CASE,PSF                                       CROS1150
  190 FORMAT (1H1 25X, 26HDOUGLAS  AIRCRAFT  COMPANY /                  CROS1160
     1       28X, 21HLONG  BEACH  DIVISION ///                          CROS1170
     2  6X,10A6,4X,10HCASE NO.  A6,10H     PSF = ,A4   //)              CROS1180
      IF (FLG22.GT.0) GO TO 230                                         CROS1190
      IF (L.GT.1.OR.FLG17.NE.0) GO TO 210                               CROS1200
      WRITE (6, 200 )                                                   CROS1210
  200 FORMAT (1H 27H ON-BODY UNIFORM CROSS FLOW )                       CROS1220
      GO TO 250                                                         CROS1230
  210 IF (TYPEC(KC).GE.0.) GO TO 230                                    CROS1240
      WRITE (6, 220 )                                                   CROS1250
  220 FORMAT (1H 31H FLOW GENERATOR * ROTATING BODY )                   CROS1260
  230 WRITE (6, 240 ) NUNC(KC)                                          CROS1270
  240 FORMAT (1H 35H ON-BODY NON-UNIFORM CROSS FLOW NO. I8)             CROS1280
  250 WRITE (6, 260 )                                                   CROS1290
  260 FORMAT (1H 5X 24H TRANSFORMED COORDINATES //                      CROS1300
     1        12X 1HX 13X 1HY 13X          2HT2 12X 2HT3   9X 5HSIN A   CROS1310
     2        6X 5HCOS  A 7X 5HSIGMA 11X 1HN 13X 3HPHI ///              CROS1320
  270 WRITE (6, 280 ) I,X1(I),Y1(I),X2(J),Y2(J),          T2(J,L),T3(J,L)CROS1330
     1,                SINA(J),COSA(J),SIG(J,L),XN(J,L),PHI(J,L)        CROS1340
  280 FORMAT (1H I3,2F14.7/ 4X 4F14.7,2F11.5,3F14.7)                    CROS1350
      I=I+1                                                             CROS1360
      J=J+1                                                             CROS1370
      IF (I.EQ.N) GO TO 290                                             CROS1380
      IF (I.LE.LCTR) GO TO 270                                          CROS1390
      LCTR=LCTR+22                                                      CROS1400
      GO TO 180                                                         CROS1410
  290 M=M+1                                                             CROS1420
      N=N+ND(M)                                                         CROS1430
      WRITE (6, 300 ) I,X1(I),Y1(I)                                     CROS1440
  300 FORMAT (1H I3, 2F14.7 //)                                         CROS1450
      I=I+1                                                             CROS1460
      IF(J.GT.NT)GO TO 310                                              CROS1470
      GO TO 270                                                         CROS1480
  310 IF(FLG22.GT.0)GO TO 330                                           CROS1490
      WRITE(6, 320 ) SUMM(L), SUMV                                      CROS1500
  320 FORMAT (1H0 10X,14H ADDED MASS = F12.7, 4X,10H VOLUME = F12.7)    CROS1510
  330 CONTINUE                                                          CROS1520
       IF (IPUVEL .EQ. 0) GO TO 340                                     CROS1530
      WRITE(6, 480 )                                                    CROS1540
      LOC = 6500                                                        CROS1550
      CALL PUNCHV ( T2, NT, NSIG, LOC, CASE )                           CROS1560
      LOC = 6900                                                        CROS1570
      CALL PUNCHV (T3, NT, NSIG, LOC, CASE ).                           CROS1580
  340 IF (FLG05.EQ.0) RETURN                                            CROS1590
C                  * OFF-BODY POINT                                     CROS1600
      DO 370 I=1,NP                                                     CROS1610
C                  * READ MATRICES X,Y,Z                                CROS1620
      READ (10) (A(J),J=1,NT),(B(J),J=1,NT),(Z(J),J=1,NT)               CROS1630
C                  * NO. OF FLOW                                        CROS1640
      DO 370 N=1,NSIG                                                   CROS1650
      SX=0.0                                                            CROS1660
      SY=0.0                                                            CROS1670
      SP=0.0                                                            CROS1680
C                  * NO. OF ELEMENTS LOOP                               CROS1690
      DO 350 J=1,NT                                                     CROS1700
```

```
      SX=SX+A(J)*SIG(J,N)                                               CROS1710
      SY=SY+B(J)*SIG(J,N)                                               CROS1720
  350 SP=SP+Z(J)*SIG(J,N)                                               CROS1730
      VX(I,N)=SX                                                        CROS1740
      PHI(I,N)=YP(I)*SP                                                 CROS1750
      IF (FLG22.GT.0) GO TO 360                                         CROS1760
      IF (FLG11.GT.0.OR.N.NE.1.OR.FLG17.GT.0) GO TO 360                 CROS1770
      VY(I,N)=SY+1.                                                     CROS1780
      VZ(I,N)=SP+1.                                                     CROS1790
      GO TO 370                                                         CROS1800
C                   * PERTURBATION OR NON-UNIFORM VY,VZ                 CROS1810
  360 VY(I,N)=SY                                                        CROS1820
      VZ(I,N)=SP                                                        CROS1830
  370 CONTINUE                                                          CROS1840
C                 * PRINT CROSS FLOW (OFF-BODY) OUTPUT                  CROS1850
      DO 470 L=1,NSIG                                                   CROS1860
      KC = L                                                            CROS1870
      IF (FLG17.LE.0) KC=L-1                                            CROS1880
      I=1                                                               CROS189C
      LCTR=43
  380 WRITE(6, 190 )HEDR,CASE,PSF                                       CROS1910
      IF (FLG22.GT.0) GO TO 410                                         CROS1920
      IF (L.GT.1.OR.FLG17.NE.0) GO TO 400                               CROS1930
      WRITE (6, 390 )                                                   CROS1940
  390 FORMAT (1H 28H OFF-BODY UNIFORM CROSS FLOW )                      CROS1950
      GO TO 430                                                         CROS1960
  400 IF (TYPEC(KC).GE.0.) GO TO 410                                    CROS1970
      WRITE (6, 220 )                                                   CROS1980
  410 WRITE (6, 420 ) NUNC(KC)                                          CROS1990
  420 FORMAT (1H 36H OFF-BODY NON-UNIFORM CROSS FLOW NO. I8)            CROS2000
  430 WRITE (6, 440 )                                                   CROS2010
  440 FORMAT (1H 5X, 24H TRANSFORMED COORDINATES //                     CROS2020
     1 12X 1HX 13X 1HY 13X 2HVX 12X 2HVY 12X 2HVZ 12X 3HPHI //)         CROS2030
  450 WRITE (6, 460 ) I,XP(I),YP(I),VX(I,L),VY(I,L),VZ(I,L),PHI(I,L)    CROS2040
  460 FORMAT (1H I3, 6F14.7)                                            CROS2050
      I=I+1                                                             CROS2060
      IF (I.GT.NP) GO TO 470                                            CROS2070
      IF (I.LE.LCTR) GO TO 450                                          CROS2080
      LCTR=LCTR+43
      GO TO 380                                                         CROS2100
  470 CONTINUE                                                          CROS2110
      IF ( IPUVEL .EQ. 0 ) RETURN                                       CROS2120
      WRITE(6, 480 )                                                    CROS2130
  480 FORMAT(1H1,88H THE FOLLOWING NUMBERS ARE THE CARD IMAGES THAT GET CROS2140
     1PUNCHED WHEN THERE IS PUNCHED OUTPUT///)                          CROS2150
      LOC = 7300                                                        CROS2160
      CALL PUNCHV ( VX, NP, NSIG, LOC, CASE )                           CROS2170
      LOC = 7700                                                        CROS2180
      CALL PUNCHV ( VY, NP, NSIG, LOC, CASE )                           CROS2190
      LOC = 8100                                                        CROS2200
      CALL PUNCHV(VZ,NP,NSIG,LOC,CASE)                                  CROS2210
      RETURN                                                            CROS2220
      END                                                               CROS2230
```

```
      SUBROUTINE ELINT3(XKSQ,XN,PHI,PIE)
C
C  THIS SUBROUTINE CALCULATES THE INCOMPLETE ELLIPTIC INTEGRAL OF THE
C  THIRD KIND. THE ARGUMENTS ARE'
C        XKSQ   VALUE OF K SQUARED
C        XN     VALUE OF MINUS ALPHA SQUARED
C        PHI    VALUE OF PHI
C        PIE    VALUE OF INCOMPLETE ELLIPTIC INTEGRAL OF THIRD KIND
      DATA HP /1.570796/
      DATA ROUND /.0000050/
      SK=XKSQ
      FN=XN
      P=PHI
      IF (FN.EQ.-1.0.AND.SK.EQ.1.0) GO TO 480
      IF(SK.GT.1.) GO TO 470
      IF(FN.LT.(-1.)) GO TO 470
      IF(P) 10 , 470 , 20
C     NORMALIZE PHI
   10 A=-1.
      P=-P
      GOTO 30
   20 A=1.
   30 B=1.
      BB=1.
      IF (ABS(P-1.570796   ).LE.10.0**(-7)) GO TO 100
      IF(P-HP) 110 , 100 , 40
   40 J=P/(2.*HP)
      XX=2*J
      P1=P-XX*HP
      P=HP
      B=-1.
      GOTO 100
   50 D=SUM
      B=0.
      IF(P1-HP) 60 , 70 , 80
   60 P=P1
      XXX=1.
      GOTO 110
   70 PIE=(XX+1.)*A*D
      GOTO 460
   80 XXX=-1.
      XX=XX+2.
      P=2.*HP-P1
      GOTO 110
   90 PIE=A*(XX*D+XXX*SUM)
      GOTO 460
  100 IF(SK.EQ.1.) GOTO 470
      IF(FN.EQ.(-1.)) GO TO 470
  110 IF(P.GT.10.E-4)GOTO 130
      IF(FN.GT.0.)GOTO 120
      SUM=P
      GOTO 440
  120 RRT=SQRT(FN)
      SUM=ATAN(P*RRT)/RRT
      GOTO 440
  130 S=SIN(P)
```

```
      S2=S**2
      C=COS(P)
      IF(SK.GT.0.64)GOTO 210
      IF(ABS(FN).GE.0.6)GOTO 160
C     POWER SERIES IN N AND K SQUARED
      SA=1.
      SB=SK/2.
      CB=S*C
      CA=P
      FM=0.
      SUM=P
      X=SUM*1.E-8
  140 SA=SB-SA*FN
      CA=(-CB/(2.*(FM+1.)))+(1.-.5/(FM+1.))*CA
      Y=SA*CA
      SUM=SUM+Y
      IF((SB*CA).GT.X) GO TO 150
      IF(ABS(Y) .LT.X) GO TO 440
  150 FM=FM+1.
      CB=CB*S2
      SB=(1.-.5/(FM+1.))*SK*SB
      GOTO 140
C     POWER SERIES IN K SQUARED
  160 PK=SK
      RT=SQRT(1.+FN)
      IF(RT.NE.0.) GO TO 170
      G=S/C
      GOTO 190
  170 IF(C.GT.4.E-3)GOTO 180
      G=(HP-(C/(RT*S)))/RT
      GOTO 190
  180 G=ATAN(RT*S/C)/RT
  190 G1=G*1.E-8
      E=P
      F=S*C
      H=1.
      SUM=G
      FM=0.
  200 G=(E-G)/FN
      H=H*(1.-0.5/(FM+1.))
      G2=H*G*PK
      SUM=SUM+G2
      IF(G2.LE.G1)GOTO 440
      FM=FM+1.
      E=-F/(2.*FM)+(1.-0.5/FM)*E
      F=F*S2
      PK=PK*SK
      GOTO 200
  210 SKP=1.-SK
      IF(S.LT.C) GO TO 320
C     ADDITION FORMULA
      ZP=SQRT(1.-SK*S2)
      RT1=SQRT(ABS(FN*(FN+1.)*(FN+SK)))
      SST=(1.-ZP)/(SK*(C+1.))
      XP=(SST*S*RT1)/(1.+FN*S2-FN*SST*C*ZP)
      IF(FN) 220 , 290 , 250
  220 IF(RT1.NE.0.) GO TO 240
```

```
      R=S/(C+1.)                                                        ELNT1140
      IF(FN.NE.(-1.)) GO TO 230                                         ELNT1150
      CF=(2.*R-SK*SST*S-(S/C)*ZP)/SKP                                   ELNT1160
      GOTO 300                                                          ELNT1170
  230 CF=(SST*(S-(2./R))+S*C/ZP)*(SK/SKP)                               ELNT1180
      GOTO 300                                                          ELNT1190
  240 IF(FN*(FN+SK) .LT.0.) GO TO 260                                   ELNT1200
  250 CF=(FN/RT1)*ATAN(XP)                                              ELNT1210
      GOTO 300                                                          ELNT1220
  260 IF(ABS(XP).GE.0.1)GOTO 270                                        ELNT1230
      YX=XP**2                                                          ELNT1240
      YX=2.*XP*(1.+YX*(1./3.+YX*(.2+YX/7.)))                            ELNT1250
      GOTO 280                                                          ELNT1260
  270 YX=ALOG((1.+XP)/(1.-XP))                                          ELNT1270
  280 CF=(FN*YX)/(2.*RT1)                                               ELNT1280
      GOTO 300                                                          ELNT1290
  290 CF=0.                                                             ELNT1300
  300 BB=-1.                                                            ELNT1310
      S=SQRT(SST)                                                       ELNT1320
      C=SQRT(1.-SST)                                                    ELNT1330
      GOTO 320                                                          ELNT1340
  310 SUM=2.*SUM-CF                                                     ELNT1350
      GOTO 440                                                          ELNT1360
  320 U=S/C                                                             ELNT1370
      V=1./C                                                            ELNT1380
      T=U*V                                                             ELNT1390
      W=U**2                                                            ELNT1400
      IF(S.GT.0.1)GOTO 330                                              ELNT1410
      R=S*(1.+S2*(1./3.+S2*(.2+S2/7.)))                                 ELNT1420
      GOTO 340                                                          ELNT1430
  330 R=ALOG(U+V)                                                       ELNT1440
  340 D=1.+FN                                                           ELNT1450
      IF(D.GT.SKP) GOTO 360                                             ELNT1460
C     POWER SERIES IN 1+N AND 1 - (K SQUARED)                           ELNT1470
      CA=1.                                                             ELNT1480
      CB=-0.5*SKP                                                       ELNT1490
      AL=(T+R)/2.                                                       ELNT1500
      BE=U*V**3                                                         ELNT1510
      FM=0.                                                             ELNT1520
      SUM=AL                                                            ELNT1530
      T1=SUM*1.E-8                                                      ELNT1540
  350 CA=-D*CA+CB                                                       ELNT1550
      AL=(BE-(2.*FM+1.)*AL)/(2.*(FM+2.))                                ELNT1560
      X=CA*AL                                                           ELNT1570
      SUM=SUM+X                                                         ELNT1580
      IF(ABS(X).LT.T1)GOTO 430                                          ELNT1590
      FM=FM+1.                                                          ELNT1600
      CB=-((2.*FM+1.)/(2.*(FM+1.)))*CB*SKP                              ELNT1610
      IF(ABS(BE).LT.10.E-30) BE=0.                                      ELNT1620
      BE=BE*W                                                           ELNT1630
      GOTO 350                                                          ELNT1640
C     POWER SERIES IN 1 - (K SQUARED)                                   ELNT1650
  360 RT=SQRT(ABS(FN))                                                  ELNT1660
      IF(FN) 370 , 380 , 390                                            ELNT1670
  370 Q=ALOG((1.+RT*S)/(1.-RT*S))/(2.*RT)                               ELNT1680
      GOTO 400                                                          ELNT1690
  380 Q=S                                                               ELNT1700
```

```
      GOTO 400
  390 Q=ATAN(RT*S)/RT
  400 SUM=FN*Q+R
      PKP=SKP
      AP=-0.5
      FM=1.
      T1=SUM*1.E-8
  410 Q=(R-Q)/D
      R=T/(2.*FM)-(1.-.5/FM)*R
      X=AP*(FN*Q+R)*PKP
      SUM=SUM+X
      IF(ABS(X).LT.T1)GOTO 420
      T=T*W
      PKP=PKP*SKP
      FM=FM+1.
      AP=-AP*(1.-.5/FM)
      GOTO 410
  420 SUM=SUM/D
  430 IF(BB.LT.0.)GOTO 310
  440 IF(B) 50 , 90 , 450
  450 PIE=A*SUM
  460 PIE=PIE+PIE*ROUND
      RETURN
C     ERROR RETURN
  470 PIE=0.
      GOTO 460
C   CASE OF PI(1,1,PHI)
  480 PIE = 0.5*(TAN(P  )/ COS(P  )+ALOG(TAN((HP+P  )/2.0)))
      GO TO 460
      END
```

```
      SUBROUTINE ELIP                                                   ELIP  20
C                                                                       ELIP  10
C                                                                       ELIP  30
C             * HASTINGS APPROXIMATION FOR ELLIPTIC INTEGRALS           ELIP  40
C                                                                       ELIP  50
      COMMON       HEDR(10)   ,CASE       ,NB        ,NNU               ELIP  60
     1             ,FLG03     ,FLG04      ,FLG05     ,FLG06     ,FLG07  ELIP  70
     2             ,FLG08     ,FLG09      ,FLG10     ,FLG11     ,FLG12  ELIP  80
     3             ,FLG13     ,FLG14      ,FLG15     ,FLG16     ,FLG17  ELIP  90
     4             ,FLG18     ,FLG19      ,FLG20     ,FLG21     ,FLG22  ELIP 100
     5             ,FLG23     ,FLG24      ,FLG25     ,FLG26     ,FLG27  ELIP 110
      COMMON  NT,      ND(11),    MN,        NUNA(5),   TYPEA(5),       ELIP 120
     1        NER1,    NER2,      NMA,       NSIGA,     NSIGC,          ELIP 130
     2        NUNC(5), TYPEC(5), NLF(11),   IEC,       NSIGEC,          ELIP 140
     3        TYPEEC(5),NUNEC(5)                                        ELIP 150
      DOUBLE PRECISION  HEDR, CASE                                      ELIP 160
      INTEGER      FLG03     ,FLG04      ,FLG05     ,FLG06     ,FLG07   ELIP 170
     1             ,FLG08     ,FLG09      ,FLG10     ,FLG11     ,FLG12  ELIP 180
     2             ,FLG13     ,FLG14      ,FLG15     ,FLG16     ,FLG17  ELIP 190
     3             ,FLG18     ,FLG19      ,FLG20     ,FLG21     ,FLG22  ELIP 200
     4             ,FLG23     ,FLG24      ,FLG25     ,FLG26     ,FLG27  ELIP 210
      REAL         MN                                                   ELIP 220
      LOGICAL PF                                                        ELIP 230
C                                                                       ELIP 240
      COMMON /CL/    X1(500),  Y1(500),  X2(500),  Y2(500),  DELL(500), ELIP 250
     1               SINA(500),COSA(500),XP(500),  YP(500)              ELIP 260
     2              ,XWAKE(11),YWAKE(11)                                ELIP 270
      COMMON /TL/    A(500),   B(500),   AX(500),  AY(500),  AZ(500),   ELIP 280
     1               CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),   ELIP 290
     2               VN(500,5),VT(500,5),BON,           IAC,            ELIP 300
     3               I,        J,        J1,       SJ,       DS,        ELIP 310
     4               DX,       DY,       NI,       XJ,       YJ,        ELIP 320
     5               XK,       EEK,      EKK,      K,        PF         ELIP 330
C                                                                       ELIP 340
C             * START                                                   ELIP 350
      ETA = 1. - XK                                                     ELIP 360
      IF (ETA) 10 , 10 , 40                                             ELIP 370
   10 IF (BON .GT. 0.5) GO TO 20                                        ELIP 380
      XI = X2(I)                                                        ELIP 390
      YI = Y2(I)                                                        ELIP 400
      GO TO 30                                                          ELIP 410
   20 XI = XP(I)                                                        ELIP 420
      YI = YP(I)                                                        ELIP 430
   30 WRITE (6, 50 ) I,XI,YI,J,XJ,YJ,XK,ETA                             ELIP 440
       ETA = 0.000005                                                   ELIP 450
   40 ELN=ALOG(ETA)                                                     ELIP 460
      EKK = 1.3862944E0      + ETA * (.9666344E-1     + ETA *           ELIP 470
     1      (.3590092E-1     + ETA * (.3742564E-1     + ETA *           ELIP 480
     2      .1451196E-1   ))) - ELN * (.5 + ETA * (.1249859E0      +    ELIP 490
     3      ETA * (.6880249E-1     + ETA * (.3328355E-1     + ETA *     ELIP 500
     4      .4417870E-2  ))))                                           ELIP 510
      EEK = 1. + ETA * (.4432514E0      + ETA * (.6260601E-1    + ETA * ELIP 520
     1      (.4757384E-1    + ETA * .1736506E-1    ))) - ELN * (ETA *   ELIP 530
     2      (.2499837E0     + ETA * (.9200180E-1     + ETA *            ELIP 540
     3      (.4069698E-1    + ETA * .5264496E-2  ))))                   ELIP 550
      RETURN                                                            ELIP 560
```

```
C
   50 FORMAT(' ERROR IN ELIP.  I=',I3,', XI=',F10.5,', YI=',F10.5,
     1',  J=',I3,', XJ=',F10.5,', YJ=',F10.5,', XK=',F8.5,', ETA=',F8.5)
      END
```

```
      SUBROUTINE ELLC (A,K,E,I)
C
C THIS SUBROUTINE CALCULATES THE ASSOCIATED COMPLETE ELLIPTIC INTEGRALS
C OF THE FIRST OR SECOND KIND
C THE ARGUMENTS ARE*
C       A    ARGUMENT (K SQUARED) FOR WHICH E' OR K' WILL BE FOUND
C       K    VALUE OF ASSOCIATED COMPLETE ELLIPTIC INTEGRAL OF FIRST KIND
C       E    VALUE OF ASSOCIATED COMPLETE ELLIPTIC INTEGRAL OF SECOND KIN
C       I    IF EQ 1, COMPUTE K ; IF EQ 2, COMPUTE E
      DOUBLE PRECISION K,E,CON(32),A,LN4,CF(29),CL(3),DLOG
      EQUIVALENCE (CON(1),CF(1)), (CON(30),CL(1))
      DATA CF  /9.65735907975890180-2,3.08855734867526940-2,1.4978988178
     17046290-2,9.65875798617531130-3,1.12089185546440920-2,1.3855601247
     2156560-2,6.69055099068979360-3,6.49984433293901 8D-4,1.2499999941 1
     379230-1,7.03124264646273610-2,4.88180585654039520-2,3.7068398934 15
     454220-2,2.71898611167882 50-2,1.41053807761580480-2,3.1831309927862
     58860-3,1.50491817836018830-4,4.43147181121558060-1,5.6805657874695
     63580-2,2.18762206471861980-2,1.25105924108446440-2,1.3034146073731
     74320-2,1.53771025285520190-2,7.33561649742903650-3,7.0980964089987
     82290-4,2.49999999361762 20-1,9.37499202496801130-2,5.8582839536559
     90240-2,4.23828074569479D-2,3.03027477284128480-2 /
      DATA CL  / 1.55251299480407210-2,3.48386794358964920-3,1.642721079
     170480250-4 /
      LN4 = 1.386294361119890D
      IF (A.EQ.0.D) GO TO 40
      GO TO ( 10 , 20 ),I
   10 K = LN4 + (((((((CON(8)*A+CON(7))*A+CON(6))*A+CON(5))*A+CON(4))*A
     1+ CON(3))*A+CON(2))*A+CON(1))*A - DLOG(A)*(0.5+(((((((CON(16)*A+
     2CON(15))*A+CON(14))*A+CON(13))*A+CON(12))*A+CON(11))*A+CON(10))*A
     3+ CON(9))*A)
      GO TO 30
   20 E = 1.0D0+(((((((CON(24)*A+CON(23))*A+CON(22   ..21))*A+CON(2
     1))*A+CON(19))*A+CON(18))*A+CON(17))*A - DLOG(A)*(((((((CON(32)*A
     2+ CON(31))*A+CON(30))*A+CON(29))*A+CON(28))*A+CON(27))*A+CON(26))*
     3A+CON(25))*A)
   30 RETURN
   40 K = 0.99999999D30
      E = 1.0D0
      RETURN
      END
```

```
      SUBROUTINE EXCROS                                                 EXCR  20
C                                                                       EXCR  10
C***   ***COMPUTE EXTRA CROSS FLOW VELOCITY COMPONENTS AND PRINT        EXCR  30
      COMMON /IPSF/ PSF                                                 EXCR  40
      COMMON         HEDR(10)  ,CASE      ,NB        ,NNU               EXCR  50
     1               ,FLG03    ,FLG04     ,FLG05     ,FLG06    ,FLG07   EXCR  60
     2               ,FLG08    ,FLG09     ,FLG10     ,FLG11    ,FLG12   EXCR  70
     3               ,FLG13    ,FLG14     ,FLG15     ,FLG16    ,FLG17   EXCR  80
     4               ,FLG18    ,FLG19     ,FLG20     ,FLG21    ,FLG22   EXCR  90
     5               ,FLG23    ,FLG24     ,FLG25     ,FLG26    ,FLG27   EXCR 100
      COMMON   NT,         ND(11),    MN,        NUNA(5),  TYPCA(5),    EXCR 110
     1         NER1,       NER2,      NMA,       NSIGA,    NSIGC,       EXCR 120
     2         NUNC(5),    TYPEC(5),  NLF(11),   IEC,      NSIGEC,      EXCR 130
     3         TYPEEC(5),NUNEC(5)                                       EXCR 140
      DOUBLE PRECISION  HEDR, CASE                                      EXCR 150
      INTEGER         FLG03    ,FLG04     ,FLG05     ,FLG06    ,FLG07   EXCR 160
     1               ,FLG08    ,FLG09     ,FLG10     ,FLG11    ,FLG12   EXCR 170
     2               ,FLG13    ,FLG14     ,FLG15     ,FLG16    ,FLG17   EXCR 180
     3               ,FLG18    ,FLG19     ,FLG20     ,FLG21    ,FLG22   EXCR 190
     4               ,FLG23    ,FLG24     ,FLG25     ,FLG26    ,FLG27   EXCR 200
      COMMON /P/ IPUVEL                                                 EXCR 210
      REAL      MN                                                      EXCR 220
C                                                                       EXCR 230
      COMMON /C4/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),  EXCR 240
     1              SINA(500),COSA(500),XP(500),  YP(500)               EXCR 250
      COMMON /TC/   RB(500,10),     SIG(500,5),    A(500),   B(500),    EXCR 260
     1              Z(500),         PHI(500,5),    XN(500,5),T(500,5),  EXCR 270
     2              T3(500,5),      NSIG,          NP,       NI,        EXCR 280
     3              SUMV,           SUMM(5)                             EXCR 290
C                                                                       EXCR 300
      DIMENSION VX(500,5),VY(500,5),VZ(500,5),T2(500,5)                 EXCR 310
C                                                                       EXCR 320
      EQUIVALENCE ( VX(1,1), XN(1,1) ), ( VY(1,1), T(1,1) ),            EXCR 330
     1   (VZ(1,1), T3(1,1) ),  (T2(1,1), T(1,1) )                       EXCR 340
C                                                                       EXCR 350
      REWIND 8                                                          EXCR 360
      IF (FLG08.EQ.0) GO TO 20                                          EXCR 370
C***   ***TITLE FOR MATRIX PRINT                                        EXCR 380
      WRITE(6, 11D )HEDR,CASE,PSF                                       EXCR 390
      WRITE (6, 10 )                                                    EXCR 400
   10 FORMAT (1H 42H MATRICES A,B,Z BY ROWS * EXTRA CROSS FLOW //)      EXCR 410
C***   ***READ EXTRA CROSS SIGMAS                                       EXCR 420
   20 DO 30 N = 1,NSIG                                                  EXCR 430
   30 READ (3) ( SIG(I,N),I = 1,NT )                                    EXCR 440
C***   ***NO. OF MIDPOINTS LOOP                                         EXCR 450
      DO 90  I = 1,NT                                                   EXCR 460
C***   ***READ MATRICES A,B,Z                                           EXCR 470
C***   ***YOU MUST SOLVE POTENTIAL MATRIX FOR EXCROS                    EXCR 480
      READ (8) ( A(J),J = 1,NT),( B (J),J = 1,NT ), ( Z(J),J = 1,NT )   EXCR 490
C***   ***NO. OF FLOWS LOOP                                             EXCR 500
      M = 0                                                             EXCR 510
      DO 50 N = 1,NSIG                                                  EXCR 520
      M = M + 2                                                         EXCR 530
      SA = 0.0                                                          EXCR 540
      SB = 0.0                                                          EXCR 550
      SZ = 0.0                                                          EXCR 560
```

```
C***    ***NO. OF ELEMENTS LOOP
        DO 40 J = 1,NT
        SA = SA + A(J) * SIG(J,N)
        SB = SB + B(J) * SIG(J,N)
     40 SZ = SZ + Z(J) * SIG(J,N)
        T2(I,N) = SB
        T3(I,N) = SZ
        XN(I,N) = SA
        PHI(I,N) = Y2(I) * SZ / 2.0
     50 CONTINUE
        IF (FLG08.EQ.0) GO TO 90
        WRITE (6, 60 ) I, (A(J),J = 1,NT)
     60 FORMAT (1H0 13H MATRIX A ROW I6/  (1H 10F10.5) )
        WRITE (6, 70 ) I, (B(J),J = 1,NT)
     70 FORMAT (1H0 13H MATRIX B ROW I6/  (1H 10F10.5) )
        WRITE (6, 80 ) I, ( Z(J),J = 1,NT)
     80 FORMAT (1H0 13H MATRIX Z ROW I6/  (1H 10F10.5) )
     90 CONTINUE
C***    ***PRINT EXTRA CROSS FLOW (ON BODY) OUTPUT
        DO 210 L = 1,NSIG
        KEC = L
        I = 1
        J = 1
        M = 1
        N = ND(M)
C***    ***M IS THE BODY NUMBER
C***    ***N IS THE NUMBER OF POINTS ON BODY M
        LCTR = 22
    100 WRITE(6, 110 )HEDR,CASE,PSF
    110 FORMAT (1H1 25X, 26HDOUGLAS  AIRCRAFT  COMPANY /
     1          28X, 21HLONG  BEACH  DIVISION ///
     2  6X,10A6,4X,10HCASE NO.  A6,10H    PSF = ,A4   //)
        IF (FLG22.GT.0) GO TO 130
        WRITE (6, 120 )NUNEC(KEC)
    120 FORMAT(41H ON-BODY NON-UNIFORM EXTRA CROSS FLOW NO. I8)
        GO TO 150
    130 WRITE  (6, 140 )
    140 FORMAT(68H  ON BODY   GENERATED (RESEP) BOUNDARY CONDITIONS   EXTR
     1A CROSS FLOW)
    150 WRITE (6, 160 )
    160 FORMAT (1H 5X 24H TRANSFORMED COORDINATES //
     1          12X 1HX 13X 1HY 13X             2HT2 12X 2HT3   9X 5HSIN A
     2          6X 5HCOS A 7X 5HSIGMA 11X 1HN 13X 3HPHI //)
    170 WRITE (6, 180 ) I,X1(I),Y1(I),X2(J),Y2(J),          T2(J,L),T3(J,L)
     1,             SINA(J),COSA(J),SIG(J,L),XN(J,L),PHI(J,L)
    180 FORMAT (1H I3,2F14.7/ 4X 4F14.7,2F11.5,3F14.7)
        I = I + 1
        J = J + 1
        IF (I.EQ.N) GO TO 190
        IF (I.LE.LCTR) GO TO 170
        LCTR = LCTR + 22
        GO TO 100
    190 M = M + 1
        N = N + ND(M)
        WRITE (6, 200 )I , X1(I), Y1(I)
    200 FORMAT (1H I3,2F14.7 //)
        I = I + 1
```

```
      IF (J.GE.NT) GO TO 210                                              EXCR1140
      GO TO 170                                                           EXCR1150
  210 CONTINUE                                                            EXCR1160
C***   ***THIS IS WHERE THE CALL FOR PUNCHED OUTPUT WILL GO               EXCR1170
      IF (FLG05.EQ.0) RETURN                                              EXCR1180
C***   ***OFF BODY POINTS                                                 EXCR1190
      DO 230 I = 1,NP                                                     EXCR1200
C***   ***READ MATRICES X,Y,Z                                             EXCR1210
      READ (8) ( A(J),J=1,NT ),(B(J),J = 1,NT), ( Z(J),J = 1,NT )         EXCR1220
      DO 230 N = 1,NSIG                                                   EXCR1230
      SX = 0.0                                                            EXCR1240
      SY = 0.0                                                            EXCR1250
      SP = 0.0                                                            EXCR1260
C***   ***NUMBER OF ELEMENTS LOOP                                         EXCR1270
      DO 220 J = 1,NT                                                     EXCR1280
      SX = SX + A(J) * SIG (J,N)                                          EXCR1290
      SY = SY + B(J) * SIG (J,N)                                          EXCR1300
  220 SP = SP + Z(J) * SIG(J,N)                                           EXCR1310
      VX(I,N) = SX                                                        EXCR1320
      VY(I,N) = SY                                                        EXCR1330
      VZ(I,N) = SP                                                        EXCR1340
      PHI(I,N) = YP(I) * SP / 2.0                                         EXCR1350
  230 CONTINUE                                                            EXCR1360
C***   ***PRINT EXTRA CROSS FLOW (OFF-BODY) OUTPUT                        EXCR1370
      DO 320 L = 1,NSIG                                                   EXCR1380
      KEC = L                                                             EXCR1390
      I = 1                                                               EXCR1400
      LCTR = 45                                                           EXCR1410
  240 WRITE(6, 110 )HEDR,CASE,PSF                                         EXCR1420
      IF (FLG22.GT.0) GO TO 260                                           EXCR1430
      WRITE(6, 250 ) NUNEC(KEC)                                           EXCR1440
  250 FORMAT (43H  OFF BODY NON-UNIFORM EXTRA CROSS FLOW NO. I8)          EXCR1450
      GO TO 280                                                           EXCR1460
  260 WRITE(6, 270 )                                                      EXCR1470
  270 FORMAT(68H OFF BODY   GENERATED (RESEP) BOUNDARY CONDITIONS   EXTREXCR1480
     1A CROSS FLOW)                                                       EXCR1490
  280 WRITE (6, 290 )                                                     EXCR1500
  290 FORMAT (1H 5X, 24H TRANSFORMED COORDINATES //                       EXCR1510
     1 12X 1HX 13X 1HY 13X 2HVX 12X 2HVY 12X 2HVZ 12X 3HPHI //)           EXCR1520
  300 WRITE (6, 310 ) I,XP(I),YP(I),VX(I,L),VY(I,L),VZ(I,L),PHI(I,L)      EXCR1530
  310 FORMAT (1H I3, 6F14.7)                                              EXCR1540
      I = I + 1                                                           EXCR1550
      IF (I.GT.NP)GO TO 320                                               EXCR1560
      IF (I.LE.LCTR) GO TO 300                                            EXCR1570
      LCTR = LCTR + 45                                                    EXCR1580
      GO TO 240                                                           EXCR1590
  320 CONTINUE                                                            EXCR1600
C***   ***THIS IS WHERE THE CALL TO PUNCHED OUTPUT   OFF BODY WILL GO     EXCR1610
      RETURN                                                              EXCR1620
      END                                                                 EXCR1630
```

```
      FUNCTION HLAMB (BETA,K)
C
C THIS SUBROUTINE CALCULATES THE HEUMAN'S LAMBDA FUNCTION OF BETA AND K
      DOUBLE PRECISION A,F,E
      REAL K
      DATA TWOP/0.63661977247/
      CALL INEL (FI,EI,PI,BETA,BETA,1.0-K**2         ,0,1,1)
      A = 1.0 - K   **2
      CALL ELLC (A              ,F,E,1)
      CALL ELLC (A              ,F,E,2)
      HLAMB = TWOP*(F*EI +(E-F)*FI)
      RETURN
      END
```

```
      SUBROUTINE INEL (F,E,PI,A,PHI,SKI,K3,K2,K1)                       INEL  20
C                                                                       INEL  10
C THIS SUBROUTINE CALCULATES THE INCOMPLETE ELLIPTIC INTEGRALS OF THE   INEL  30
C FIRST, SECOND AND THIRD KINDS. THE ARGUMENTS ARE*                     INEL  40
C        F      VALUE OF INCOMPLETE ELLIPTIC INTEGRAL OF THE FIRST KIND INEL  50
C        E      VALUE OF INCOMPLETE ELLIPTIC INTEGRAL OF THE SECOND KIND INEL  60
C        PI     VALUE OF INCOMPLETE ELLIPTIC INTEGRAL OF THE THIRD KIND INEL  70
C        A      VALUE OF ALPHA SQUARED                                  INEL  80
C        PHI    VALUE OF PHI                                            INEL  90
C        SKI    VALUE OF K SQUARED                                      INEL 100
C        K3      IF EQ 0, DO NOT COMPUTE PI ; IF NE 0, COMPUTE PI       INEL 110
C        K2      IF EQ 0, DO NOT COMPUTE E  ; IF NE 0, COMPUTE E        INEL 120
C        K1      IF EQ 0, DO NOT COMPUTE F  ; IF NE 0, COMPUTE F        INEL 130
      DOUBLE PRECISION ARG,FD,ED                                        INEL 140
      DATA PIT/1.57079633/                                              INEL 150
      E=0.0                                                             INEL 160
      F=0.0                                                             INEL 170
      IF (K3.EQ.0) GO TO 10                                             INEL 180
      CALL ELINT3 (SKI,-A,PHI,PI)                                       INEL 190
   10 IF (K1.EQ.0) GO TO 30                                             INEL 200
      IF (ABS(PHI-PIT).GT.10.0**(-7)) GO TO 20                          INEL 210
      ARG=1.0-SKI                                                       INEL 220
      CALL ELLC (ARG,FD,ED,1)                                           INEL 230
      F=FD                                                              INEL 240
      GO TO 30                                                          INEL 250
   20 CALL ELINT3 (SKI,0.0,PHI,F)                                       INEL 260
   30 IF (K2.EQ.0) GO TO 50                                             INEL 270
      IF (ABS(PHI-PIT).GT.10.0**(-7)) GO TO 40                          INEL 280
      ARG=1.0-SKI                                                       INEL 290
      CALL ELLC (ARG,FD,ED,2)                                           INEL 300
      E=ED                                                              INEL 310
      GO TO 50                                                          INEL 320
   40 CALL ELINT3 (SKI,-SKI,PHI,E)                                      INEL 330
      E=(1.0-SKI)*E+0.5*SKI*SIN(2.0*PHI)/SQRT(1.0-SKI*SIN(PHI)**2)      INEL 340
   50 RETURN                                                            INEL 350
      END                                                               INEL 360
```

```
      SUBROUTINE IRAKES(X,Y,NN)
C
C THIS ROUTINE READS IN MASS-FLOW RAKE TYPE INPUT AND CALCULATES THE
C POINT SPACING, OFF-BODY POINT LOCATIONS, RAKE UNIT NORMAL VECTORS,
C AND AREAS, AND IDENTIFIER STORAGES.
      COMMON /BLOCKR/ NRAKES,RNAME(20,9),RAKEA(20),RUNITX(20),
     1 RUNITY(20),RDS(20),NRPTS(20),COSTH(20),IRAKF,NOFF,X1R(20),
     2 Y1R(20),X2R(20),Y2R(20)
      DIMENSION X(1),Y(1)
      DATA PI/3.1415927/
C
      NN = 0
C
C
      DO 40   IRAKE=1,NRAKES
      READ (5, 50 ) X1,Y1,X2,Y2,N,(RNAME(IRAKE,I),I=1,9)
      X1R(IRAKE) = X1
      Y1R(IRAKE) = Y1
      X2R(IRAKE) = X2
      Y2R(IRAKE) = Y2
      IF (N .GE. 4) GO TO 10
      WRITE (6, 60 ) N
      N = 4
      GO TO 20
C
   10 NO = N
      N = (N/2)*2
      IF (N .EQ. NO) GO TO 20
      WRITE (6, 70 ) NO,N
C
   20 DX = X2 - X1
      DY = Y2 - Y1
      D = SQRT(DX**2 + DY**2)
      UX = DX/D
      UY = DY/D
      COSTH(IRAKE) = UY
C CONSTRUCT UNIT NORMAL TO THIS RAKE ...
      RUNITX(IRAKE) = UY
      RUNITY(IRAKE) = -UX
C CALCULATE RAKE AREA ...
      RAKEA(IRAKE) = PI*D*(Y1+Y2)
C
C THE NUMBER OF NEEDED OFF-BODY POINTS IS 1 LESS THAN THE NUMBER OF
C INTERVALS (THE ACTUAL VALUES AT BOTH ENDS WILL BE OBTAINED BY
C EXTRAPOLATION) ...
      FN = N
      RDS(IRAKE) = D/FN
      DX = DX/FN
      DY = DY/FN
      M = N - 1
      NRPTS(IRAKE) = M
      DO 30 I=1,M
      NN = NN + 1
      FI = I
      X(NN) = X1 + FI*DX
   30 Y(NN) = Y1 + FI*DY
```

```
C
C
C TEMPORARY WRITE ...
CCC    WRITE (6,2) IRAKE,X1,Y1,X2,Y2,N,(RNAME(IRAKE,I),I=1,9)
CCC    M1 = NN - M + 1
CCC    WRITE (6,3) (X(J),Y(J),J=M1,NN)
CCC    WRITE (6,4) RUNITX(IRAKE),RUNITY(IRAKE),RAKEA(IRAKE),RDS(IRAKE)
C
   40 CONTINUE
      RETURN
C
   50 FORMAT(4F10.5,I5,8A4,A3)
   60 FORMAT('0INPUT ERROR FOR FLOW RAKE NUMBER',I3,'.',/10X,'ATTEMPT TO
     1 USE FEWER THAN 4 INTERVALS.  PROGRAM HAS RESET N=4.')
   70 FORMAT('0INPUT ERROR FOR FLOW RAKE NUMBER',I3,'.',/10X,'ATTEMPT TO
     1 USE AN ODD NUMBER OF INTERVALS ( N=',I3,').',/10X,'PROGRAM HAS RE
     2SET N=',I3,'.')
      END
```

```
      SUBROUTINE MATRIX                                                 MTRX  20
C                                                                       MTRX  10
C                                                                       MTRX  30
C               * COMPUTE MATRIX A,B,Z OR X,Y,Z                         MTRX  40
C                                                                       MTRX  50
      COMMON /BLOCK1/ IGEOMF(9),ISIGF(9),IPNCHF,NONEW(9)                MTRX  60
      COMMON /BLOCK3/NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE,LSSE,SO,MTRX  70
     1 NSMALL                                                           MTRX  80
      COMMON /BLOCK4/A11(500),A12(500),A13(500),A21(500),A22(500),      MTRX  90
     1A23(500)                                                          MTRX 100
      COMMON /PRINTF/ PRIN1,PRIN2,PRIN3                                 MTRX 110
      LOGICAL PRIN1,PRIN2,PRIN3                                         MTRX 120
      COMMON      HEDR(10)  ,CASE      ,NB        ,NNU                  MTRX 130
     1                ,FLG03    ,FLG04     ,FLG05     ,FLG06     ,FLG07 MTRX 140
     2                ,FLG08    ,FLG09     ,FLG10     ,FLG11     ,FLG12 MTRX 150
     3                ,FLG13    ,FLG14     ,FLG15     ,FLG16     ,FLG17 MTRX 160
     4                ,FLG18    ,FLG19     ,FLG20     ,FLG21     ,FLG22 MTRX 170
     5                ,FLG23    ,FLG24     ,FLG25     ,FLG26     ,FLG27 MTRX 180
      COMMON     NT,       ND(11),   MN,      NUNA(5),  TYPCA(5),       MTRX 190
     1           NER1,     NER2,     NMA,     NSIGA,    NSIGC,          MTRX 200
     2           NUNC(5),  TYPEC(5), NLF(11), IEC,      NSIGEC,         MTRX 210
     3           TYPEEC(5),NUNEC(5)                                     MTRX 220
      DOUBLE PRECISION  HEDR, CASE                                      MTRX 230
      INTEGER     FLG03     ,FLG04     ,FLG05     ,FLG06     ,FLG07     MTRX 240
     1                ,FLG08    ,FLG09     ,FLG10     ,FLG11     ,FLG12 MTRX 250
     2                ,FLG13    ,FLG14     ,FLG15     ,FLG16     ,FLG17 MTRX 260
     3                ,FLG18    ,FLG19     ,FLG20     ,FLG21     ,FLG22 MTRX 270
     4                ,FLG23    ,FLG24     ,FLG25     ,FLG26     ,FLG27 MTRX 280
      REAL        MN                                                    MTRX 290
      LOGICAL NONEW,OLDTES,PF                                           MTRX 300
      LOGICAL NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE                MTRX 310
      REAL LSSE                                                         MTRX 320
C                                                                       MTRX 330
      COMMON /ECF/ ECX(500), ECY(500), ECZ(500)                         MTRX 340
      COMMON  /RNGWNG/ VA(500,2),  VR(500,2),VAN(500), VAT(500)         MTRX 350
      COMMON /CL/   X1(500),  Y1(500),  X2(500),   Y2(500),  DELL(500), MTRX 360
     1               SINA(500),COSA(500),XP(500),   YP(500)             MTRX 370
     2               ,XWAKE(11),YWAKE(11)                               MTRX 380
      COMMON /TL/    A(500),   B(500),   AX(500),   AY(500),  AZ(500),  MTRX 390
     1               CX(500),  CY(500),  CZ(500),   AXV(500),AYV(500),  MTRX 400
     2               VN(500,5),VT(500,5),BON,            IAC,           MTRX 410
     3               I,        J,        JI,        SJ,       DS,       MTRX 420
     4               DX,       DY,       NI,        XJ,       YJ,       MTRX 430
     5               XK,       EEK,      EKK,       K,        PF        MTRX 440
C                                                                       MTRX 450
C               * START                                                 MTRX 460
C               * INITIALIZE                                            MTRX 470
      LI=NT                                                             MTRX 480
      BON=0.0                                                           MTRX 490
      YZERO=0.0                                                         MTRX 500
      NSMALL = 0                                                        MTRX 510
      REWIND 1                                                          MTRX 520
C***   ***TEST TYPE OF FLOW AND SET INDICATORS IAC AND IEC              MTRX 530
C***   ***CROSS FLOW ONLY                         IAC = -1  IEC = -1    MTRX 540
C***   ***AXISYMMETRIC FLOW ONLY                  IAC = +1  IEC = -1    MTRX 550
C***   ***EXTRA CROSS FLOW ONLY                   IAC =  0  IEC =  0    MTRX 560
```

```
C***     ***CROSS FLOW AND AXISYMMETRIC FLOW  IAC =  0  IEC = -1          MTRX 570
C***     ***CROSS FLOW AND EXTRA CROSS FLOWW  IAC = -1  IEC = +1          MTRX 580
C***     ***AXISYMMETRIC AND EXTRA CROSS FLOW IAC = +1  IEC = +1          MTRX 590
C***     ***AXISYMMETRIC, CROSS, AND EXTRA CROSS  IAC=0 IEC = +1          MTRX 600
         IF(FLG03) 40 , 10 , 40                                           MTRX 610
      10 IF(FLG04) 30 , 20 , 30                                           MTRX 620
      20 IAC = 0                                                          MTRX 630
         IEC = 0                                                          MTRX 640
         GO TO 100                                                        MTRX 650
      30 IAC = -1                                                         MTRX 660
         GO TO 70                                                         MTRX 670
      40 IF(FLG04) 50 , 60 , 50                                           MTRX 680
      50 IAC = 0                                                          MTRX 690
         GO TO 70                                                         MTRX 700
      60 IAC = 1                                                          MTRX 710
      70 IF(FLG21) 80 , 90 , 80                                           MTRX 720
      80 IEC = +1                                                         MTRX 730
         GO TO 100                                                        MTRX 740
      90 IEC = -1                                                         MTRX 750
     100 ASSIGN 220 TO K1                                                 MTRX 760
         IF (FLG15.GT.0) ASSIGN 180 TO K1                                 MTRX 770
     110 DO 130 I=1,L1                                                    MTRX 780
         DO 120 J = 1,5                                                   MTRX 790
         VN(I,J) = 0.                                                     MTRX 800
     120 VT(I,J) = 0.                                                     MTRX 810
         VAN(I)=0.0                                                       MTRX 820
     130 VAT(I)=0.0                                                       MTRX 830
C CHECK FOR NECESSARY INITIALIZATIONS REQUIRED WHEREVER THE NEW (I.E.     MTRX 840
C PARABOLIC) FORMULAE ARE TO BE USED ...                                  MTRX 850
         NOAXI = .TRUE.                                                   MTRX 860
         NOCROS = .TRUE.                                                  MTRX 870
         NOVORT = .TRUE.                                                  MTRX 880
         IF ((IAC.EQ.-1) .AND. (IEC.EQ.-1)) NOCROS = .FALSE.              MTRX 890
         IF ((IAC.EQ.+1) .AND. (IEC.EQ.-1)) NOAXI = .FALSE.               MTRX 900
         IF ((IAC.EQ.0) .AND. (IEC.EQ.-1)) NOAXI = .FALSE.                MTRX 910
         IF ((IAC.EQ.0) .AND. (IEC.EQ.-1)) NOCROS = .FALSE.               MTRX 920
         IF ((IAC.EQ.1) .AND. (IEC.EQ.+1)) NOCROS = .FALSE.               MTRX 930
         IF (FLG15 .NE. 0) NOVORT = .FALSE.                               MTRX 940
         OLDIES = .TRUE.                                                  MTRX 950
         J1 = 1                                                           MTRX 960
         DO 140 L=1,NB                                                    MTRX 970
         J2 = J1 + ND(L) - 2                                              MTRX 980
         IF (NONEW(L)) GO TO 140                                          MTRX 990
         OLDIES = .FALSE.                                                 MTRX1000
         CALL COEFF(J1,J2)                                                MTRX1010
     140 J1 = J2 + 1                                                      MTRX1020
         IF (PRIN3) WRITE (6, 610 )                                       MTRX1030
C                                                                         MTRX1040
C                                                                         MTRX1050
C                   *  I MIDPOINT LOOP                                    MTRX1060
         DO 390 I=1,L1                                                    MTRX1070
C                   *  J ELEMENT LOOP                                     MTRX1080
C                      J1 IS THE COORDINATE COUNTER                       MTRX1090
C                      J IS THE ELEMENT COUNTER                           MTRX1100
         J1=0                                                             MTRX1110
         N1 = 0                                                           MTRX1120
C INITIALIZE THE ENTIRE ROW ...                                           MTRX1130
```

```
      DO 150 J=1,NT                                                     MTRX1140
      AX(J) = 0.0                                                       MTRX1150
      AY(J) = 0.0                                                       MTRX1160
      AZ(J) = 0.0                                                       MTRX1170
      CX(J) = 0.0                                                       MTRX1180
      CY(J) = 0.0                                                       MTRX1190
      CZ(J) = 0.0                                                       MTRX1200
      AXV(J) = 0.0                                                      MTRX1210
  150 AYV(J) = 0.0                                                      MTRX1220
      IF (FLG23 .GT. 0)CALL NOTS                                        MTRX1230
      IF (PRIN3) WRITE (6, 620 ) I                                      MTRX1240
      DO 220 K=1,NB                                                     MTRX1250
      NOV1 = .FALSE.                                                    MTRX1260
      NOV2 = .FALSE.                                                    MTRX1270
      IF (ISIGF(K) .EQ. 1) NOV2 = .TRUE.                                MTRX1280
      IF (ISIGF(K) .EQ. 2) NOV1 = .TRUE.                                MTRX1290
C                                                                       MTRX1300
C BEGIN MATRIX FORMULATION OF THE COLUMNS OF THIS ITH ROW AS INFLUENCED MTRX1310
C BY THIS KTH BODY ...                                                  MTRX1320
      M1 = N1 + 1                                                       MTRX1330
      N1 = N1 + ND(K) - 1                                               MTRX1340
      FIRSTE = .TRUE.                                                   MTRX1350
      LASTE = .FALSE.                                                   MTRX1360
C                                                                       MTRX1370
C                                                                       MTRX1380
      DO 170 J=M1,N1                                                    MTRX1390
      J1 = J1 + 1                                                       MTRX1400
      PF = (FLG18.GT.0 .AND. J.GT.NMA) .OR. (FLG20.GT.0)                MTRX1410
      IF (J .EQ. N1) LASTE = .TRUE.                                     MTRX1420
      IF (NONEW(K)) GO TO 160                                           MTRX1430
C                                                                       MTRX1440
      CALL PARAB                                                        MTRX145I
C     CALL OVERLAY (PAN,1,1,6HRECALL)                                          C
      GO TO 170                                                         MTRX1460
C                                                                       MTRX1470
  160 CALL XYZ                                                          MTRX148I
C 160 CALL OVERLAY (PAN,1,2,6HRECALL)                                          C
C                                                                       MTRX1490
  170 FIRSTE = .FALSE.                                                  MTRX1500
C                                                                       MTRX1510
C                                                                       MTRX1520
      J1 = J1 + 1                                                       MTRX1530
C                                                                       MTRX1540
C MATRIX FORMULATION OF COLUMNS FOR THIS BODY HAVE BEEN COMPLETED.      MTRX1550
C                                                                       MTRX1560
      GO TO K1, ( 180 , 220 )                                           MTRX1570
  180 IF (NLF(K).GT.0) GO TO 220                                        MTRX1580
      IF (BON.EQ.0.) GO TO 200                                          MTRX1590
      DO 190 J = M1, N1                                                 MTRX1600
      VN(I,K) = VN(I,K)+AXV(J)                                          MTRX1610
  190 VT(I,K) = VT(I,K)+AYV(J)                                          MTRX1620
      GO TO 220                                                         MTRX1630
  200 DO 210 J = M1, N1                                                 MTRX1640
      VN(I,K) = VN(I,K) +AXV(J)*SINA(I) - AYV(J)*COSA(I)                MTRX1650
  210 VT(I,K) = VT(I,K) +AXV(J)*COSA(I) + AYV(J)*SINA(I)                MTRX1660
  220 CONTINUE                                                          MTRX1670
      IF (PRIN1) WRITE (1) (AX(J),AY(J),CX(J),CY(J),CZ(J),AXV(J),       MTRX1680
```

```
     1 AYV(J),J=1,NT)                                                  MTRX1690
      IF( FLG08 .LE.0  .OR.  FLG15 .LE. 0 )GO TO 270                   MTRX1700
C                                                                      MTRX1710
C*** *  PRINT STRIP VORTEX MATRICES                                     MTRX1720
C                                                                      MTRX1730
      IF( I .EQ. 1  .AND.  BON .EQ. 0. )WRITE(6, 230 )                 MTRX1740
      IF( I .EQ. 1  .AND.  BON .EQ. 1. )WRITE(6, 240 )                 MTRX1750
  230 FORMAT(1H1,31H STRIP VORTEX MATRICES  ON BODY //)                MTRX1760
  240 FORMAT(1H1,31H STRIP VORTEX MATRICES OFF BODY //)                MTRX1770
      WRITE(6, 250 )I,( AXV(J),J=1,NT)                                 MTRX1780
      WRITE(6, 260 ) ( AYV(J),J=1,NT)                                  MTRX1790
  250 FORMAT(1H0,5H ROW,I4/9H X MATRIX / (6E20.7) )                    MTRX1800
  260 FORMAT(9H Y MATRIX / (6E20.7) )                                  MTRX1810
  270 IF (BON) 280 , 320 , 280                                         MTRX1820
C              * SAVE X,Y,Z ON TAPE *OFF BODY POINTS                   MTRX1830
C***    ***SAVE X,Y,Z ON TAPE   *   OFF BODY POINTS                    MTRX1840
C***    ***AXISYMMETRIC FLOW   *   TAPE 9                              MTRX1850
C***    ***CROSS FLOW   *   TAPE 10                                    MTRX1860
C***    ***EXTRA CROSS FLOW   *   TAPE 8                               MTRX1870
  280 IF(IEC.EQ.-1)GO TO 290                                           MTRX1880
      WRITE(8) (ECX(J),J=1,NT), (ECY(J),J=1,NT), (ECZ(J),J=1,NT)       MTRX1890
      IF (IEC) 290 , 390 , 290                                         MTRX1900
  290 IF(IAC) 310 , 300 , 300                                          MTRX1910
  300 WRITE (9) (AX(J),J=1,NT),(AY(J),J=1,NT),(AZ(J),J=1,NT)           MTRX1920
      IF (IAC) 390 , 310 , 390                                         MTRX1930
  310 WRITE (10)(CX(J),J=1,NT),(CY(J),J=1,NT),(CZ(J),J=1,NT)           MTRX1940
      GO TO 390                                                        MTRX1950
C***    ***SAVE ON TAPE   *   ON BODY                                  MTRX1960
C***    ***AXISYMMETRIC FLOW   *   TAPE 9                              MTRX1970
C***    ***CROSS FLOW   *   TAPE 10                                    MTRX1980
C***    ***EXTRA CROSS FLOW   *   TAPE 8                               MTRX1990
C***    ***IEC = -1 MEANS NO EXTRA CROSS FLOW                          MTRX2000
  320 IF (IEC.EQ.-1) GO TO 340                                         MTRX2010
      DO 330 J = 1,NT                                                  MTRX2020
      A(J) = -ECX(J) * SINA(I) + ECY(J) * COSA(I)                      MTRX2030
  330 B(J) = ECX(J) * COSA(I) + ECY(J) * SINA(I)                       MTRX2040
      WRITE (8) (A(J),J=1,NT), (B(J),J=1,NT), (ECZ(J),J=1,NT)          MTRX2050
      IF ( IEC ) 340 , 390 , 340                                       MTRX2060
  340 IF (IAC) 370 , 350 , 350                                         MTRX2070
  350 DO 360 J=1,NT                                                    MTRX2080
      A(J)=-AX(J)*SINA(I)+AY(J)*COSA(I)                                MTRX2090
  360 B(J)=AX(J)*COSA(I)+AY(J)*SINA(I)                                 MTRX2100
      WRITE (9) (A(J),J=1,NT),(B(J),J=1,NT),(AZ(J),J=1,NT)             MTRX2110
      IF (IAC) 390 , 370 , 390                                         MTRX2120
  370 DO 380 J=1,NT                                                    MTRX2130
      A(J)=-CX(J)*SINA(I)+CY(J)*COSA(I)                                MTRX2140
  380 B(J)=CX(J)*COSA(I)+CY(J)*SINA(I)                                 MTRX2150
      WRITE (10) (A(J),J=1,NT),(B(J),J=1,NT),(CZ(J),J=1,NT)            MTRX2160
  390 CONTINUE                                                         MTRX2170
C                                                                      MTRX2180
      IF (.NOT.PRINI) GO TO 410                                        MTRX2190
C MATRIX PRINT ...                                                     MTRX2200
      REWIND 1                                                         MTRX2210
      WRITE (6, 580 )                                                  MTRX2220
      DO 400 I=1,LI                                                    MTRX2230
      READ (1) (AX(J),AY(J),CX(J),CY(J),CZ(J),AXV(J),AYV(J),J=1,NT)    MTRX2240
      WRITE (6, 590 ) (I,J,AX(J),AY(J),CX(J),CY(J),CZ(J),AXV(J),AYV(J), MTRX2250
```

```
     1      J=1,NT)
  400 CONTINUE
      REWIND 1
C
  410 IF (PRIN2) WRITE (6, 600 ) (J,A11(J),A12(J),A13(J),A21(J),A22(J),
     1      A23(J),J=1,NT)
      IF (FLG15.LE.0) GO TO 550
      IF (BON.NE.0.) GO TO 520
C*** ***ON BODY
      READ (4)
C
C*** *  IF FLG23 .GT. 0 INPUT NNU MUST BE NONE, HENCE NNU = 0 HERE
C
      IF (NNU.LE.0) GO TO 430
      DO 420 I = 1, NNU
      READ (4) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
  420 WRITE (3) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
      REWIND 3
      REWIND 4
      READ (4)
  430 N=NSIGA-1
      IF (FLG16.GT.1) N=NSIGA
C*** ***N = 0 MEANS 1 RHS ONLY  NO NON-UNIFORM FLOW
C*** *  IF FLG23 .GT. 0 INPUT NNU MUST BE NONE, HENCE N = 0  HERE
C
      IF (N.EQ.0) GO TO 450
      DO 440 I = 1, N
      READ (3) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
  440 WRITE(4) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
  450 M=0
C*** *  SKIP PRESCRIBED VORTEX INPUTS ON 4 SO THAT STRIP VORTEX
C*** *  SUMMATIONS CAN GO BEHIND IT
C
      IF(FLG23 .GT. 0)READ(4)
      DO 460 J = 1, NB
      IF (NLF(J).GT.0) GO TO 460
      NSIGA=NSIGA+1
      NNU=NNU+1
      WRITE (4) M,(VN(I,J),I=1,NT),(VT(I,J),I=1,NT)
  460 CONTINUE
C
C*** *  SINCE NO NNU IS INPUT WITH FLG23 GT 0, NSIGC IS MAX OF 1 AND M
C*** *  SHOLD BE 0 IF FLG17 LE 0.  DONT USE FLG17 WITH FLG23
C
      IF (FLG23 .LE. 0)GO TO 490
C
C*** *  RING WING OPTION - FORM COLUMN (PARTLY) FOR PRESCRIBED VORTICIY
C*** *RHS
C
      IBOD = 0
      DO 480 J=1,NB
      IF( NLF(J) .GT. 0)GO TO 480
      IBOD = IBOD + 1
C
C*** *  CONVERT (ON BODY) X,Y  TO NORMAL, TANGENTIAL
C
      DO 470 I=1,NT
```

```
      VAN(I)= VA(I,IBOD)*SINA(I)-VR(I,IBOD)*COSA(I)
  470 VAT(I)=VA(I,IBOD)*COSA(I)+ VR(I,IBOD)*SINA(I)
      WRITE(4)(VAN(I),I=1,NT),(VAT(I),I=1,NT)
  480 CONTINUE
  490 M = NSIGC - 1
      IF (FLG17.GT.0) M=NSIGC
      IF (M.LE.0) GO TO 510
      DO 500  I = 1, M
      READ (3) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
  500 WRITE (4) MSF,(A(J),J=1,NT),(B(J),J=1,NT)
  510 REWIND 3
      GO TO 550
C*** ***OFF BODY
  520 DO 530  J = 1, NB
      IF (NLF(J).GT.0) GO TO 530
      WRITE(4)  (VN(I,J), I = 1,L1), (VT(I,J),I = 1,L1)
  530 CONTINUE
      IF(FLG23 .LE. 0)GO TO 550
      IBOD = 0
      DO 540  J=1,NB
      IF( NLF(J) .GT. 0)GO TO 540
      IBOD = IBOD + 1
      WRITE(4) ( VA(I,IBOD),I=1,L1 ), ( VR(I,IBOD),I=1,L1)
  540 CONTINUE
C                 * TEST IF OFF BODY COMPLETED
C                 * TEST IF OFF BODY
  550 IF (FLG05.EQ.0.OR.BON.NE.0.) GO TO 570
C                 * INITIAL FOR OFF BODY * THEN RE-ENTER I,J LOOPS
      BON=1.
      L1=NO(NB+1)
      IF (.NOT. OLDIES) GO TO 110
      DO 560  I=1,L1
      X2(I) = XP(I)
  560 Y2(I) = YP(I)
      GO TO 110
  570 REWIND 9
      REWIND 8
      REWIND 10
      REWIND 4
      RETURN
C
  580 FORMAT(51H1VELOCITY INFLUENCE COEFFICIENT MATRICES FOLLOW ...,/
     1 3X,1HI,4X,1HJ,7X,2HAX,11X,2HAY,14X,2HCX,11X,2HCY,11X,2HCZ,14X,
     2 3HAXV,10X,3HAYV,/1H )
  590 FORMAT(1H ,I3,I4,2F13.6,3X,3F13.6,3X,2F13.6)
  600 FORMAT(4HI   J,5X,3HA11,8X,3HA12,8X,3HA13,8X,3HA21,8X,3HA22,8X,
     1 3HA23,//(1H ,I3,1X,6F11.6))
  610 FORMAT(1H1,20X,36HDETAIL OF VIJ MATRIX FORMULATION ...,/1H0)
  620 FORMAT(1H0,25(5H*****),/1H ,60X,3HROW,I4)
      END
```

```
      SUBROUTINE MISNA2 (SIG)                                           MSNA  20
C                                                                       MSNA  10
C                                                                       MSNA  30
C               * SOLVE LINEAR SIMULTANEOUS EQUATIONS BY SEIDEL ITERATIONMSNA  40
C                                                                       MSNA  50
      COMMON      HEDR(10)  ,CASE     ,NB       ,NNU                    MSNA  60
     1            ,FLG03    ,FLG04    ,FLG05    ,FLG06    ,FLG07        MSNA  70
     2            ,FLG08    ,FLG09    ,FLG10    ,FLG11    ,FLG12        MSNA  80
     3            ,FLG13    ,FLG14    ,FLG15    ,FLG16    ,FLG17        MSNA  90
     4            ,FLG18    ,FLG19    ,FLG20    ,FLG21    ,FLG22        MSNA 100
     5            ,FLG23    ,FLG24    ,FLG25    ,FLG26    ,FLG27        MSNA 110
      COMMON  NT,      NO(11),   MN,      NUNA(5),  TYPEA(5),           MSNA 120
     1        NER1,    NER2,     NMA,     NSIGA,    NSIGC,              MSNA 130
     2        NUNC(5), TYPEC(5), NLF(11), ICC,      NSIGFC,             MSNA 140
     3        TYPFEC(5),NUNEC(5)                                        MSNA 150
      DOUBLE PRECISION  HEDR, CASE                                      MSNA 160
      INTEGER     FLG03    ,FLG04    ,FLG05    ,FLG06    ,FLG07         MSNA 170
     1            ,FLG08    ,FLG09    ,FLG10    ,FLG11    ,FLG12        MSNA 180
     2            ,FLG13    ,FLG14    ,FLG15    ,FLG16    ,FLG17        MSNA 190
     3            ,FLG18    ,FLG19    ,FLG20    ,FLG21    ,FLG22        MSNA 200
     4            ,FLG23    ,FLG24    ,FLG25    ,FLG26    ,FLG27        MSNA 210
      REAL        MN                                                    MSNA 220
C                                                                       MSNA 230
      COMMON /C27/  A(500),   R(500,4),    NSIG,     IT                 MSNA 240
C                                                                       MSNA 250
      DIMENSION    SIG(500,4),   KFLAG(4), DSIG1(4), DSIG(500,4)        MSNA 260
C                                                                       MSNA 270
C               * START                                                 MSNA 280
C               * INITIALIZE                                            MSNA 290
      NTU=0                                                             MSNA 300
      ITER=0                                                            MSNA 310
      NCONV=0                                                           MSNA 320
      DO 10 J=1,NSIG                                                    MSNA 330
      KFLAG(J)=0                                                        MSNA 340
      DO 10 I=1,NT                                                      MSNA 350
   10 SIG(I,J)=0.0                                                      MSNA 360
   20 DO 30 I=1,NSIG                                                    MSNA 370
   30 DSIG1(I)=0.0                                                      MSNA 380
C               * COMPUTE SIGMA AND DELTA SIGMA                         MSNA 390
      DO 140 I=1,NT                                                     MSNA 400
      IF (NTU-3) 40 , 90 , 100                                          MSNA 410
   40 IF (FLG12.NE.0) GO TO 60                                          MSNA 420
C               * PLACE A IN LEFT SIDE MATRIX                           MSNA 430
      IF (IT.EQ.10) GO TO 50                                            MSNA 440
      READ (9) (A(L),L=1,NT)                                            MSNA 450
      GO TO 80                                                          MSNA 460
   50 READ (10) (A(L),L=1,NT)                                           MSNA 470
      GO TO 80                                                          MSNA 480
C               * PLACE PHI IN LEFT SIDE MATRIX                         MSNA 490
   60 IF (IT.EQ.10) GO TO 70                                            MSNA 500
      READ (9) (A(L),L=1,NT),(A(L),L=1,NT),(A(L),L=1,NT)                MSNA 510
      GO TO 80                                                          MSNA 520
   70 READ (10) (A(L),L=1,NT),(A(L),L=1,NT),(A(L),L=1,NT)               MSNA 530
C               * SAVE LEFT SIDE MATRIX                                 MSNA 540
   80 WRITE (3) (A(L),L=1,NT)                                           MSNA 550
      WRITE (11) (A(L),L=1,NT)                                          MSNA 560
```

```
      GO TO 110
C                  * READ LEFT SIDE MATRIX
   90 READ (3) (A(L),L=1,NT)
      GO TO 110
  100 READ (11) (A(L),L=1,NT)
  110 DO 140 J=1,NSIG
      IF (KFLAG(J).NE.0) GO TO 140
      SUM=0.0
      DO 120 L=1,NT
  120 SUM=SUM+A(L)*SIG(L,J)
      DSIG(I,J)=(R(I,J)-SUM)/A(I)
      IF (FLG09.NE.0) GO TO 130
      SIG(I,J)=SIG(I,J)+DSIG(I,J)
  130 IF (ABS(DSIG(I,J)).GT.DSIG1(J)) DSIG1(J)=ABS(DSIG(I,J))
  140 CONTINUE
      IF (FLG09.LE.0) GO TO 160
      DO 150 J=1,NSIG
      DO 150 I=1,NT
  150 SIG(I,J)=SIG(I,J)+DSIG(I,J)
C                  * TEST FOR SOLUTION
  160 REWIND 3
      REWIND 11
      ITER=ITER+1
      DO 170 J=1,NSIG
      IF (KFLAG(J).NE.0) GO TO 170
      IF (DSIG1(J).GE.1.E-6) GO TO 170
      KFLAG(J)=ITER
      NCONV=NCONV+1
      IF (NCONV.EQ.NSIG) GO TO 190
  170 CONTINUE
      IF (ITER.EQ.100) GO TO 190
      IF (NTU.EQ.3) GO TO 180
      NTU=3
      GO TO 20
  180 NTU=11
      GO TO 20
C                  * PRINT NO. OF ITERATIONS
  190 DO 230 J=1,NSIG
      IF (KFLAG(J).NE.0) GO TO 210
      WRITE (6, 200 )
  200 FORMAT (1H0 7X 36H NO CONVERGENCE AFTER 100 ITERATIONS )
      GO TO 230
  210 WRITE (6, 220 ) KFLAG(J)
  220 FORMAT (1H0 5X I5,1X 36H ITERATIONS REQUIRED FOR CONVERGENCE )
  230 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE NOTS
C
      COMMON       HEDR(10)  ,CASE     ,NB       ,NNU
     1             ,FLG03    ,FLG04    ,FLG05    ,FLG06    ,FLG07
     2             ,FLG08    ,FLG09    ,FLG10    ,FLG11    ,FLG12
     3             ,FLG13    ,FLG14    ,FLG15    ,FLG16    ,FLG17
     4             ,FLG18    ,FLG19    ,FLG20    ,FLG21    ,FLG22
     5             ,FLG23    ,FLG24    ,FLG25    ,FLG26    ,FLG27
C
      COMMON  NT,      ND(11),   MN,       NUNA(5),  TYPEA(5),
     1        NER1,    NER2,     NMA,      NSIGA,    NSIGC,
     2        NUNC(5), TYPEC(5), NLF(11),  IEC,      NSIGEC,
     3        TYPEEC(5),NUNEC(5)
      DOUBLE PRECISION HEDR,CASE
C
      COMMON  /RNGWNG/ VA(500,2),  VR(500,2),VAN(500), VAT(500)
C
      INTEGER      FLG03    ,FLG04    ,FLG05    ,FLG06    ,FLG07
     1             ,FLG08    ,FLG09    ,FLG10    ,FLG11    ,FLG12
     2             ,FLG13    ,FLG14    ,FLG15    ,FLG16    ,FLG17
     3             ,FLG18    ,FLG19    ,FLG20    ,FLG21    ,FLG22
     4             ,FLG23    ,FLG24    ,FLG25    ,FLG26    ,FLG27
C
      COMMON /CL/   XI(500),  YI(500),  X2(500),  Y2(500),  DELS(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
     2              ,XWAKE(11),YWAKE(11)
C
      COMMON /TL/   A(500),   B(500),   AX(500),  AY(500),  AZ(500),
     1              CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),
     2              VN(500,5),VT(500,5),BON,          IAC,
     3              I,        J,        J1,       SJ,       DS,
     4              DX,       DY,       NI,       XJ,       YJ,
     5              XK,       EEK,      EKK,      K,        PF
C
      REAL  MN,KAY
      LOGICAL PF
C
C*** * FOLLOWING ARE 3 ARITHMETIC FUNCTIONS
C
      OMEG(Z,SMALLR,BIGR) = 1.0 + ( ( Z**2 + (SMALLR-BIGR)**2) /
     1                    (2.D*SMALLR * BIGR) )
      BETAF(Z,SMALLR,BIGR)= ARSIN( Z / ( SQRT(Z**2 + (SMALLR-BIGR)**2)))
C
C
      AKAYF(Z,SMALLR,BIGR)= SQRT( (4.0 * SMALLR * BIGR) /
     1                    ( Z**2 + (SMALLR + BIGR)**2 ) )
C
      DO 30  IBOD =1,FLG14
      IF(BON.NE.0.0) GO TO 15
      Z = X2(I) - XWAKE(IBOD)
      Y=Y2(I)
      GOTO16
   15 Z=XP(I) - XWAKE(IBOD)
      Y=YP(I)
   16 OMEGA = OMEG( Z, Y     , YWAKE(IBOD) )
      BETA  =BETAF( Z, Y     , YWAKE(IBOD) )
```

```
      KAY   =AKAYF( Z, Y     , YWAKE(IBOD) )
      CALL  OC(OMEGA,QM,Q)
C
C   ***   SMALLR IS Y
C   ***   BIGR IS YWAKE(IBOD)
      IF( Y     .LE. YWAKE(IBOD) ) GO TO 10
C
C   ***   SMALLR GT BIGR
C
      BIGK = ( Z / ( SQRT( Y      * YWAKE(IBOD) )*2.0 ) ) * QM -
     1          ( 1.570796 * HLAMB(BETA,KAY) )
      GO TO 20
C
C*** *  SMALLR LE BIGR
C
   10 BIGK = 3.141593 + ( Z / ( SQRT( Y      * YWAKE(IBOD) )*2.0) ) *QM *
     1        ( 1.570796 * HLAMB(BETA,KAY) )
C
C*** *  NOTE THAT VA AND VR WILL NOT YET BE MULTIPLIED BY  DGAMMA/DZ
C*** *  WHICH IS REALLY THE INPUT PRESCRIBED VORTICITY
C
   20 VA(I,IBOD) = BIGK / 6.283185
   30 VR(I,IBOD) = -(Q * (SQRT(YWAKE(IBOD) / Y       ) ) )  /  6.283185
      RETURN
      END
```

```
      SUBROUTINE PAPAB                                                  PARB  21
C                                                                       PARB  10
C     OVERLAY (PAN,1,2)                                                        C
C     PROGRAM PARAB                                                            C
C                                                                       PARB  30
C CONTROL FOR PARABOLIC X,Y,Z MATRICES COMPUTATION.                     PARB  40
C                                                                       PARB  50
      COMMON       HEDR(10)   ,CASE       ,NB         ,NNU              PARB  60
     1                ,FLG03  ,FLG04      ,FLG05      ,FLG06    ,FLG07  PARB  70
     2                ,FLG08  ,FLG09      ,FLG10      ,FLG11    ,FLG12  PARB  80
     3                ,FLG13  ,FLG14      ,FLG15      ,FLG16    ,FLG17  PARB  90
     4                ,FLG18  ,FLG19      ,FLG20      ,FLG21    ,FLG22  PARB 100
     5                ,FLG23  ,FLG24      ,FLG25      ,FLG26    ,FLG27  PARB 110
      COMMON      NT,       ND(11),   MN,       NUNA(5),  TYPEA(5),     PARB 120
     1            NER1,     NER2,     NMA,      NSIGA,    NSIGC,        PARB 130
     2            NUNC(5),  TYPEC(5), NLF(11),  IEC,      NSIGEC,       PARB 140
     3            TYPEEC(5),NUNEC(5)                                    PARB 150
      COMMON /CL/    X1(500),  Y1(500),  X2(500),  Y2(500),  DELL(500), PARB 160
     1               SINA(500),COSA(500),XP(500),  YP(500)              PARB 170
     2               ,XWAKE(11),YWAKE(11)                               PARB 180
      COMMON /TL/    A(500),   B(500),   AX(500),  AY(500),  AZ(500),   PARB 190
     1               CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),   PARB 200
     2               VN(500,5),VT(500,5),BON,           IAC,            PARB 210
     3               I,        J,        J1,       SJ,       DS,        PARB 220
     4               DX,       DY,       NI,       XJ,       YJ,        PARB 230
     5               XK,       EEK,      CKK,      K,        PF         PARB 240
      COMMON /BLOCK2/ HCURV(500),HARC(500)                              PARB 250
      COMMON /BLOCK3/NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE,LSSE,SO,PARB 260
     1 NSMALL                                                           PARB 270
      LOGICAL NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE                PARB 280
      DOUBLE PRECISION  HEDR, CASE                                      PARB 290
      INTEGER      FLG03      ,FLG04      ,FLG05      ,FLG06    ,FLG07  PARB 300
     1                ,FLG08  ,FLG09      ,FLG10      ,FLG11    ,FLG12  PARB 310
     2                ,FLG13  ,FLG14      ,FLG15      ,FLG16    ,FLG17  PARB 320
     3                ,FLG18  ,FLG19      ,FLG20      ,FLG21    ,FLG22  PARB 330
     4                ,FLG23  ,FLG24      ,FLG25      ,FLG26    ,FLG27  PARB 340
      REAL L                                                            PARB 350
C                                                                       PARB 360
      IF (BON .NE. 0.0) GO TO 20                                        PARB 370
C (NOTE ... BON=0.0 FOR ON-BODY POINTS, BON=1.0 FOR OFF-BODY POINTS.)   PARB 380
      IF (I .NE. J) GO TO 30                                            PARB 390
C                                                                       PARB 400
C I=J PATH ...                                                          PARB 410
      SPRIME = HARC(I)                                                  PARB 420
      ETA = SPRIME/Y2(I)                                                PARB 430
      IF (ETA .GT. .08) GO TO 10                                        PARB 440
C                                                                       PARB 450
C ENTIRE ELEMENT IS TO BE CONSIDERED THE SINGULAR SUB-ELEMENT ...       PARB 460
      LSSE = SPRIME                                                     PARB 470
      CALL PARAB1                                                       PARB 480
      GO TO 90                                                          PARB 490
C                                                                       PARB 500
C USE ONLY THE CENTRAL PORTION OF THE ELEMENT AS THE SINGULAR           PARB 510
C SUB-ELEMENT AND THEN ADD IN THE 2 END PIECE CONTRIBUTIONS ...         PARB 520
   10 LSSE = .08*Y2(I)                                                  PARB 530
      CALL PARAB1                                                       PARB 540
```

```
      XJ = X2(I)                                                        PARB 550
      YJ = Y2(I)                                                        PARB 560
      NI = 33                                                           PARB 570
      DS = (SPRIME-LSSE)/32.                                            PARB 580
      SO = -SPRIME                                                      PARB 590
      CALL PARAB2                                                       PARB 600
      SO = -SO                                                          PARB 610
      DS = -DS                                                          PARB 620
      CALL PARAB2                                                       PARB 630
      GO TO 90                                                          PARB 640
C                                                                       PARB 650
C I.NE.J PATH ...                                                       PARB 660
C COMPUTE MINIMUM DISTANCE TO ITH CONTROL POINT FROM THE JTH ELEMENT     PARB 670
C ENDS AND CONTROL POINT ...                                            PARB 680
C                                                                       PARB 690
C OFF-BODY ...                                                          PARB 700
   20 J1P1 = J1 + 1                                                     PARB 710
      D1 = (XP(I)-X1(J1))**2 + (YP(I)-Y1(J1))**2                        PARB 720
      D2 = (XP(I)-X2(J))**2 + (YP(I)-Y2(J))**2                          PARB 730
      D3 = (XP(I)-X1(J1P1))**2 + (YP(I)-Y1(J1P1))**2                    PARB 740
      GO TO 40                                                          PARB 750
C                                                                       PARB 760
C ON-BODY                                                               PARB 770
   30 J1P1 = J1 + 1                                                     PARB 780
      D1 = (X2(I)-X1(J1))**2 + (Y2(I)-Y1(J1))**2                        PARB 790
      D2 = (X2(I)-X2(J))**2 + (Y2(I)-Y2(J))**2                          PARB 800
      D3 = (X2(I)-X1(J1P1))**2 + (Y2(I)-Y1(J1P1))**2                    PARB 810
C                                                                       PARB 820
   40 DMINSQ = D1                                                       PARB 830
      IF (D2 .LT. DMINSQ) DMINSQ = D2                                   PARB 840
      IF (D3 .LT. DMINSQ) DMINSQ = D3                                   PARB 850
      DMIN = SQRT(DMINSQ)                                               PARB 860
      IF (DMIN .EQ. 0.0) GO TO 60                                       PARB 870
      NI = 16.*HARC(J)/DMIN + 0.9                                       PARB 880
      IF (NI .GT. 0) GO TO 50                                           PARB 890
      NI = 3                                                            PARB 900
      DS = HARC(J)                                                      PARB 910
      GO TO 80                                                          PARB 920
   50 NI = 2*NI                                                         PARB 930
      IF (NI .LE. 128) GO TO 70                                         PARB 940
   60 NI = 129                                                          PARB 950
      DS = HARC(J)/64.                                                  PARB 960
      GO TO 80                                                          PARB 970
   70 XNI = NI                                                          PARB 980
      DS = 2.*HARC(J)/XNI                                               PARB 990
      NI = NI + 1                                                       PARB1000
   80 XJ = X2(J)                                                        PARB1010
      YJ = Y2(J)                                                        PARB1020
      SO = -HARC(J)                                                     PARB1030
      CALL PARAB2                                                       PARB1040
C                                                                       PARB1050
   90 RETURN                                                            PARB1060
C  90 CONTINUE                                                          C
C                                                                       PARB1070
      END                                                               PARB1080
```

```
      SUBROUTINE PARAB1                                                 PRB1  20
C                                                                       PRB1  10
C                                                                       PRB1  30
C     THIS ROUTINE CALCULATES THE SINGULAR SUB-ELEMENT VELOCITY         PRB1  40
C     CONTRIBUTION FOR FLAT OR CURVED ELEMENTS, WITH PIECEWISE          PRB1  50
C     CONSTANT-, LINEAR-, OR QUADRATIC-SOURCE DENSITY.                  PRB1  60
C                                                                       PRB1  70
      COMMON /BLOCK2/HCURV(500), HARC(500)                              PRB1  80
      COMMON /BLOCK3/NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE,LSSE,SO,PRB1  90
     1 NSMALL                                                           PRB1 100
      COMMON /BLOCK4/A11(500),A12(500),A13(500),A21(500),A22(500),      PRB1 110
     1A23(500)                                                          PRB1 120
      COMMON /TL/     A(500),    B(500),    AX(500),   AY(500),  AZ(500),PRB1 130
     1                CX(500),   CY(500),   CZ(500),   AXV(500),AYV(500), PRB1 140
     2                VN(500,5),VT(500,5),BON,            IAC,           PRB1 150
     3                I,         J,         J1,        SJ,       DS,     PRB1 160
     4                DX,        DY,        N1,        XJ,       YJ,     PRB1 170
     5                XK,        EEK,       EKK,       K,        PF      PRB1 180
      COMMON /CL/     X1(500),   Y1(500),   X2(500),   Y2(500),  DELL(500),PRB1 190
     1                SINA(500),COSA(500),XP(500),    YP(500)            PRB1 200
     2                ,XWAKE(11),YWAKE(11)                               PRB1 210
      COMMON /PRINTF/ PRIN1,PRIN2,PRIN3                                 PRB1 220
      LOGICAL PRIN1,PRIN2,PRIN3                                         PRB1 230
      LOGICAL NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE                PRB1 240
      REAL LSSE                                                         PRB1 250
      DATA ALOG8/2.079441/,TWOPI/6.283185/                              PRB1 260
      LOGICAL PF
C     NOTE....................                                          PRB1 270
C     LSSE = DIMENSIONAL HALF-LENGTH OF THE SINGULAR SUB-ELEMENT.       PRB1 280
C CAPITAL S PRIME = CAPSP = NON-DIMENSIONAL HALF-ARC LENGTH OF          PRB1 290
C     SINGULAR SUB-ELEMENT (WHICH MAY BE .LE. TOTAL HALF-ARC LE         PRB1 300
C                                  OF THIS ELEMENT)                     PRB1 310
C                                                                       PRB1 320
      R = Y2(J)                                                         PRB1 330
      C = HCURV(J)*R                                                    PRB1 340
      CAPSP=LSSE/R                                                      PRB1 350
      SIN=SINA(J)                                                       PRB1 360
      COS=COSA(J)                                                       PRB1 370
      SC=SIN*COS                                                        PRB1 380
      SO8=CAPSP/8.0                                                     PRB1 390
      ALOGS8=ALOG(SO8)                                                  PRB1 400
      ALOGS=ALOG(CAPSP)                                                 PRB1 410
      SSQ=SIN**2                                                        PRB1 420
      CSQ=COS**2                                                        PRB1 430
      S3 =CAPSP**3                                                      PRB1 440
      RSQ=R**2                                                          PRB1 450
      CC = C**2                                                         PRB1 460
      M  =J                                                             PRB1 470
      IF (FIRSTE) M=J+1                                                 PRB1 480
      IF (LASTE) M=J-1                                                  PRB1 490
      MM1=M-1                                                           PRB1 500
      MP1=M+1                                                           PRB1 510
C     CHECK FOR AXISYMMETRIC FLOW.....                                  PRB1 520
      IF(NOAXI) GO TO 10                                                PRB1 530
      VCAX=(2.*SC-4.*C*SIN)*CAPSP+(SC*(SSQ/12.+.18055555+ALOGS8/12.)+   PRB1 540
     1(C/32.)*(-4.*SC-8.*C*SIN*2.*SIN*SSQ+2.*SIN-8.*C*SC-2.*ALOG8*SIN   PRB1 550
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```
     2+SIN+16.*ALOGS*SIN))*S3 + TWOPI*SIN                                PRB1 560
      VCAY=(2.*ALOGS8+2.*SSQ+4.*C*COS)*CAPSP+(-3.-3.*ALOGS8*2.*SSQ**2    PRB1 570
     1 +3.*SSQ-8.*C*(COS+1.)-6.*C*ALOGS8*COS-32.*C**3*COS+16.*C**2       PRB1 580
     2 +2.*C*COS-12.*C*SIN*SC*ALOGS*(4.*C    )-1.3333333*C*COS)*S3/24.   PRB1 590
     3 -TWOPI*COS                                                        PRB1 600
      AX(J) = AX(J) + VCAX                                               PRB1 610
      AY(J) = AY(J) + VCAY                                               PRB1 620
C                                                                        PRB1 630
      IF (NOV1) GO TO 10                                                 PRB1 640
      V1AX= R*(4.*COS*CAPSP + (COS*(-7.-6.*ALOGS8-6.*SSQ)+24.*C*         PRB1 650
     1         (CSQ-2.*C*COS-2.*SSQ))*S3/36.)                            PRB1 660
      V1AY= R*(4.*SIN*CAPSP+(-6.*SIN*SSQ+6.*SIN*ALOGS8-11.*SIN+48.*C*SC  PRB1 670
     1 -48.*C**2*SIN)*S3/36.)                                            PRB1 680
      AX(MM1)=AX(MM1)+A11(J)*V1AX                                        PRB1 690
      AY(MM1)=AY(MM1)+A11(J)*V1AY                                        PRB1 700
      AX(M)=AX(M)+A12(J)*V1AX                                            PRB1 710
      AY(M)=AY(M)+A12(J)*V1AY                                            PRB1 720
      AX(MP1)=AX(MP1)+A13(J)*V1AX                                        PRB1 730
      AY(MP1)=AY(MP1)+A13(J)*V1AY                                        PRB1 740
C                                                                        PRB1 750
      IF(NOV2) GO TO 10                                                  PRB1 760
      V2AX=RSQ*((2.*SC-4.*C*SIN)*S3/3.)                                  PRB1 770
      V2AY= RSQ*(ALOGS8+0.66666667*SSQ+2.*C*COS)*2.*S3/3.                PRB1 780
      AX(MM1)=AX(MM1)+A21(J)*V2AX                                        PRB1 790
      AY(MM1)=AY(MM1)+A21(J)*V2AY                                        PRB1 800
      AX(M)=AX(M)+A22(J)*V2AX                                            PRB1 810
      AY(M)=AY(M)+A22(J)*V2AY                                            PRB1 820
      AX(MP1)=AX(MP1)+A23(J)*V2AX                                        PRB1 830
      AY(MP1)=AY(MP1)+A23(J)*V2AY                                        PRB1 840
C                                                                        PRB1 850
C      CHECK FOR CROSSFLOW.......                                        PRB1 860
   10 IF (NOCROS) GO TO 20                                               PRB1 870
      VOCX=2.*(SIN*(COS-2.*C)*CAPSP+(-SC*(9.+6.*ALOGS8-2.*SSQ)           PRB1 880
     1 +SIN*C*(12.*ALOG8-10.-12.*SSQ-8.*CSQ-32.*C*COS+8.*SIN             PRB1 890
     2 +32.*C**2+4.-12.*ALOGS))*S3/48.) + TWOPI*SIN                      PRB1 900
      VOCY=2.*((2.*SSQ+ALOGS8+2.*C)*CAPSP+(9.+(27.-24.*SSQ)*ALOGS8       PRB1 910
     1 +6.*SSQ**2-43.*SSQ-36.*C*SIN*SC+48.*C**2*CSQ-96.*C**3*COS +       PRB1 920
     2C*(60.*COS*ALOGS8+84.*COS-12.))*S3/144.) - TWOPI*COS               PRB1 930
      VOCZ=-4.*(1.+ALOGS8)*CAPSP+((6.*SSQ-9.)*ALOGS8+10.*SSQ             PRB1 940
     1 +C*(24.-16.*COS-24.*COS*ALOGS8))*S3/36.                           PRB1 950
      CX(J)=CX(J)+VOCX                                                   PRB1 960
      CY(J)=CY(J)+VOCY                                                   PRB1 970
      CZ(J)=CZ(J)+VOCZ                                                   PRB1 980
C                                                                        PRB1 990
      IF (NOV1) GO TO 20                                                 PRB11000
      V1CX=R*(4.*COS*CAPSP+0.66666667*(COS*(0.75*ALOGS8+0.375            PRB11010
     1 -0.25*SSQ)+C*(CSQ-SSQ-2.*C*COS))*S3)                              PRB11020
      V1CY= R*(4.*SIN*CAPSP+(SIN*(-6.*SSQ+30.*ALOGS8+29.                 PRB11030
     1 +48.*C*(COS-C)))*S3/36.)                                          PRB11040
      V1CZ= R*(0.66666667*SIN*(-ALOGS8-1.3333333 )*S3)                   PRB11050
      CX(MM1)=CX(MM1)+A11(J)*V1CX                                        PRB11060
      CY(MM1)= CY(MM1)+A11(J)*V1CY                                       PRB11070
      CZ(MM1)=CZ(MM1)+A11(J)*V1CZ                                        PRB11080
      CX(M) = CX(M) + A12(J)*V1CX                                        PRB11090
      CY(M) = CY(M) + A12(J)*V1CY                                        PRB11100
      CZ(M) = CZ(M) + A12(J)*V1CZ                                        PRB11110
      CX(MP1) = CX(MP1) + A13(J)*V1CX                                    PRB11120
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      CY(MP1) = CY(MP1) + A13(J)*V1CY                                   PRB11130
      CZ(MP1) = CZ(MP1) + A13(J)*V1CZ                                   PRB11140
C                                                                       PRB11150
      IF (NOV2) GO TO 20                                                PRB11160
      V2CX=RSQ*(0.66666667*SIN*(COS-2.*C)*S3)                           PRB11170
      V2CY=RSQ*((16.+6.*ALOGS8+6.*SSQ+12.*C*COS)*S3/9.)                 PRB11180
      V2CZ=RSQ*(0.66666667*(-2.*ALOGS8-3.3333333)*S3)                   PRB11190
      CX(MM1)=CX(MM1)+A21(J)*V2CX                                       PRB11200
      CY(MM1)=CY(MM1)+A21(J)*V2CY                                       PRB11210
      CZ(MM1)=CZ(MM1)+A21(J)*V2CZ                                       PRB11220
      CX(M) = CX(M)+A22(J)*V2CX                                         PRB11230
      CY(M)=CY(M)+A22(J)*V2CY                                           PRB11240
      CZ(M)=CZ(M)+A22(J)*V2CZ                                           PRB11250
      CX(MP1)=CX(MP1)+A23(J)*V2CX                                       PRB11260
      CY(MP1)=CY(MP1)+A23(J)*V2CY                                       PRB11270
      CZ(MP1)=CZ(MP1)+A23(J)*V2CZ                                       PRB11280
C                                                                       PRB11290
C     CHECK FOR VORTEX FLOW........                                     PRB11300
   20 IF (NOVORT) GO TO 30                                              PRB11310
      VCVX= (2.*(ALOGS8-SSQ-2.*C*COS))*CAPSP + (-9.+ALOGS8*(-9.+12.*SSQ)PRB11320
     1      +SSQ*(23.+144.*CC-6.*SSQ) -24.*C + COS*(-72.*SSC + C*(-22.  PRB11330
     2      +12.*ALOG8+108.*SSQ+60.*ALOGS-48.*C*(COS+C))))*S3/72.       PRB11340
     3      + TWOPI*COS                                                 PRB11350
      VCVY= 2.*(SC-2.*C*SIN)*CAPSP-(SC*(9.+6.*ALOGS8                    PRB11360
     1 -2.*SSQ-24.*C*COS+96.*C**2)+SIN*C*(62.+132.*SSQ                  PRB11370
     2 -36.*ALOG8))*S3/24. + 0.88888888*ALOGS*C*SIN*S3 + TWOPI*SIN      PRB11380
      AXV(J) = VCVX                                                     PRB11390
      AYV(J) = VCVY                                                     PRB11400
C                                                                       PRB11410
C                                                                       PRB11420
   30 IF (.NOT. PRIN3) GO TO 40                                         PRB11430
      WRITE (6, 50 ) J,CAPSP                                            PRB11440
      WRITE (6, 60 ) VCAX,VCAY,VCCX,VCCY,VCCZ,VCVX,VCVY                 PRB11450
      IF (NOV1) GO TO 40                                                PRB11460
      WRITE (6, 70 ) V1AX,V1AY,V1CX,V1CY,V1CZ                           PRB11470
      IF (NOV2) GO TO 40                                                PRB11480
      WRITE (6, 80 ) V2AX,V2AY,V2CX,V2CY,V2CZ                           PRB11490
C                                                                       PRB11500
   40 IF(.NOT.PF)RETURN
      AX(J)=AXV(J)-TWOPI*COS
      AY(J)=AYV(J)-TWOPI*SIN
      AXV(J)=AX(J)
      AYV(J)=AY(J)
      RETURN
C                                                                       PRB11520
C                                                                       PRB11530
   50 FORMAT('0PARAB1. I=J=',I3,', CAPSP=',F8.5)                        PRB11540
   60 FORMAT(1H ,10X,'VCAX=',F9.5,', VCAY=',F9.5,', VCCX=',F9.5,        PRB11550
     1 ', VCCY=',F9.5,', VCCZ=',F9.5,', VCVX=',F9.5,', VCVY=',F9.5)     PRB11560
   70 FORMAT(1H ,10X,'V1AX=',F9.5,', V1AY=',F9.5,', V1CX=',F9.5,        PRB11570
     1 ', V1CY=',F9.5,', V1CZ=',F9.5)                                   PRB11580
   80 FORMAT(1H ,10X,'V2AX=',F9.5,', V2AY=',F9.5,', V2CX=',F9.5,        PRB11590
     1 ', V2CY=',F9.5,', V2CZ=',F9.5)                                   PRB11600
      END                                                               PRB11610
```

```
      SUBROUTINE PARAB2
C
C     THIS ROUTINE CALCULATES THE VELOCITY CONTRIBUTIONS OF
C     OFF-DIAGONAL (AND ENDS OF THE ON-DIAGONAL) ELEMENTS BY A
C     SIMPSON-RULE.  ELEMENTS MAY BE FLAT OR CURVED, WITH PIECEWISE
C     CONSTANT-, LINEAR-, OR QUADRATIC-SOURCE DENSITY.
      COMMON /BLOCK2/HCURV(500), HARC(500)
      COMMON /BLOCK3/NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE,LSSE,SO,
     1 NSMALL
      COMMON /BLOCK4/A11(500),A12(500),A13(500),A21(500),A22(500),
     1A23(500)
      COMMON /BLOCK5/ X,Y,SINAL,COSAL,HC,M,MM1,MP1,R
      COMMON /CL/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELL(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
     2             ,XWAKE(11),YWAKE(11)
      COMMON /TL/   A(500),    B(500),    AX(500),   AY(500),   AZ(500),
     1              CX(500),   CY(500),   CZ(500),   AXV(500),AYV(500),
     2              VN(500,5),VT(500,5),BON,              IAC,
     3              I,         J,         J1,        SJ,        DS,
     4              DX,        DY,        NI,        XJ,        YJ,
     5              XK,        EEK,       EKK,       K,         PF
      COMMON /EPSBLK/ EPSLON
      COMMON /PRINTF/ PRIN1,PRIN2,PRIN3
      LOGICAL PRIN1,PRIN2,PRIN3,YSMALL
      LOGICAL NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE
      LOGICAL PF
      DIMENSION VOAXIX(129),VOAXIY(129),VOCRSX(129),VOCRSY(129),
     1 VOCRSZ(129), VOVORX(129),VOVORY(129),XRING(129),YRING(129)
      DATA PI/3.1415927/
C
      IF (BON .GT. 0.5) GO TO 10
C
C ON-BODY ...
      X = X2(I)
      Y = Y2(I)
      GO TO 20
C
C OFF-BODY ...
   10 X = XP(I)
      Y = YP(I)
C
   20 SINAL=SINA(J)
      COSAL=COSA(J)
      HC = HCURV(J)
      M = J
      IF (FIRSTE) M=J+1
      IF (LASTE) M=J-1
      MM1=M-1
      MP1=M+1
      IF (Y .EQ. 0.0) GO TO 30
      DX = X - XJ
      DY = Y - YJ
      R = SQRT(DX**2 + DY**2)
      IF (I .EQ. J) R = DELL(I)/2.
      IF ((R/Y) .GE. EPSLON) GO TO 30
C USE SMALL ELEMENT FORMULAE ...
```

```
      CALL PARAB3
      NSMALL = NSMALL + 1
      RETURN
C
C
C     BEGIN BY GENERATING THE INDUCED VELOCITIES AT THE ENDS OF NI
C     INTERVALS (OF UNIFORM LENGTH)....
   30 S = SO
      DO 110 L = 1,NI
      SSQ=S**2
C     CALCULATE LOCAL SOURCE RADIUS, QA, AND AXIAL LOCATION, QB...
      QA = YJ + SINAL*S+HC*COSAL*SSQ
      QB = XJ + COSAL*S-HC*SINAL*SSQ
      XRING(L) = QB
      YRING(L) = QA
      IF (QA .GT. 0.0) GO TO 39
      VOAXIX(L) = 0.0
      VOAXIY(L) = 0.0
      VOCRSX(L) = 0.0
      VOCRSY(L) = 0.0
      VOCRSZ(L) = 0.0
      VOVORX(L) = 0.0
      VOVORY(L) = 0.0
      GO TO 110
C
C     CALCULATE THE COMPLETE ELLIPTIC INTEGRALS, K(K) AND E(K),
C              OF THE FIRST AND SECOND KINDS....
   39 XMB=X-QB
      XMBSQ= XMB**2
      YMASQ = (Y-QA)**2
      YPASQ=(Y+QA)**2
      T1 = YPASQ + XMBSQ
      XK= 4.*QA*Y/T1
      CALL ELIP
C     SUBROUTINE ELIP RETURNS THE VALUES AS EKK AND EEK.
C
      YSQ = Y**2
      ASQ = QA**2
      ROOT1 = SQRT(T1)
      T2 = YMASQ + XMBSQ
      T3 = XMBSQ + ASQ
      Q1 = (-4.*EEK)/(ROOT1*T2)
      Q2 = (2./ROOT1)*(EKK+(YSQ-ASQ-XMBSQ)*EEK/T2)
      YSMALL = (YSQ/T3) .LT. .0001
      IF (YSMALL) GO TO 40
      GO TO 50
   40 ROOT32 = (SQRT(T3))**3
      T4 = PI*QA/ROOT32
      T3SQ = T3**2
C
   50 IF (NOAXI) GO TO 70
      IF (YSMALL) GO TO 60
      VOAXIX(L) = Q1*QA*XMB
      VOAXIY(L) = -Q2*QA/Y
      GO TO 70
   60 VOAXIX(L) = (-2.*XMB*T4)*(1.0+0.75*YSQ*(3.0*ASQ-2.*XMBSQ)/T3SQ)
      VOAXIY(L) = -Y*T4*(2.*XMBSQ-ASQ)/T3
```

```
C
   70 IF (NOCROS) GO TO 90
      IF (YSMALL) GO TO 80
      VOCRSX(L) = 2.*(XMB    /(Y*ROOT1))*(EKK-(YSQ+T3)*EEK/T2)
      VOCRSY(L)=2.*(1./(YSQ*ROOT1))*(-(T3)*EKK+(T3**2+YSQ*(XMBSQ-ASQ))
     1 *EEK/T2)
      VOCRSZ(L)=2.*    (ROOT1/YSQ)*((YSQ+T3)*EKK/T1-EEK)
      GO TO 90
   80 VOCRSX(L) = -3.*QA*XMB*Y*T4/T3
      VOCRSY(L) = QA*T4*(1.0-0.125*YSQ*(4.*XMBSQ-ASQ)/T3SQ)
      VOCRSZ(L) = QA*T4*(1.0+0.375*YSQ*(ASQ-4.*XMBSQ)/T3SQ)
C
   90 IF (NOVORT) GO TO 110
      VOVORX(L) = (ASQ-YSQ)*Q1 - Q2
      IF (YSMALL) GO TO 100
      VOVORY(L) = Y*XMB*Q1 + XMB*Q2/Y
      GO TO 110
  100 VOVORY(L) = 0.0
C
  110 S = S + DS
C
C
      ASSEMBLE THE ROW OF EACH DESIRED MATRIX...
      IF (NOAXI) GO TO 120
      CALL SIMSON(VOAXIX,NI,DS,VOAX)
      CALL SIMSON(VOAXIY,NI,DS,VOAY)
      AX(J) = AX(J) + VOAX
      AY(J) = AY(J) + VOAY
C
  120 IF (NOCROS ) GO TO 130
      CALL SIMSON(VOCRSX,NI,DS,VOCX)
      CALL SIMSON(VOCRSY,NI,DS,VOCY)
      CALL SIMSON(VOCRSZ,NI,DS,VOCZ)
      CX(J) = CX(J) + VOCX
      CY(J) = CY(J) + VOCY
      CZ(J) = CZ(J) + VOCZ
C
  130 IF (NOVORT) GO TO 140
      CALL SIMSON(VOVORX,NI,DS,VOVX)
      CALL SIMSON(VOVORY,NI,DS,VOVY)
      AXV(J) = AXV(J) + VOVX
      AYV(J) = AYV(J) + VOVY
C
C
  140 CONTINUE
C
C
      IF (.NOT. PRIN3) GO TO 150
      WRITE (6, 260 ) I,J,NI,SO,DS,X,Y
      WRITE (6, 270 ) (L,XRING(L),YRING(L),VOAXIX(L),VOAXIY(L),
     1  VOCRSX(L),VOCRSY(L),VOCRSZ(L),VOVORX(L),VOVORY(L),L=1,NI)
      WRITE (6, 280 ) VOAX,VOAY,VOCX,VOCY,VOCZ,VOVX,VOVY
C
C
  150 IF (NOVI) GO TO 250
      IF (NOAXI) GO TO 170
      S = SO
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```
      DO 160 L = 1,NI                                                   PRB21590
      VOAXIX(L) = VOAXIX(L)*S                                           PRB21600
      VOAXIY(L) = VOAXIY(L)*S                                           PRB21610
  160 S = S+DS                                                          PRB21620
      CALL SIMSON (VOAXIX,NI,DS,V1AX)                                   PRB21630
      CALL SIMSON (VOAXIY,NI,DS,V1AY)                                   PRB21640
      AX(MM1) = AX(MM1) + A11(J)*V1AX                                   PRB21650
      AY(MM1) = AY(MM1) + A11(J)*V1AY                                   PRB21660
      AX(M) = AX(M) + A12(J)*V1AX                                       PRB21670
      AY(M) = AY(M) + A12(J)*V1AY                                       PRB21680
      AX(MP1) = AX(MP1) + A13(J)*V1AX                                   PRB21690
      AY(MP1) = AY(MP1) + A13(J)*V1AY                                   PRB21700
  170 IF (NOCROS) GO TO 190                                             PRB21710
      S = SO                                                            PRB21720
      DO 180 L = 1,NI                                                   PRB21730
      VOCRSX(L) = VOCRSX(L)*S                                           PRB21740
      VOCRSY(L) = VOCRSY(L)*S                                           PRB21750
      VOCRSZ(L) = VOCRSZ(L)*S                                           PRB21760
  180 S = S + DS                                                        PRB21770
      CALL SIMSON(VOCRSX,NI,DS,V1CX)                                    PRB21780
      CALL SIMSON(VOCRSY,NI,DS,V1CY)                                    PRB21790
      CALL SIMSON(VOCRSZ,NI,DS,V1CZ)                                    PRB21800
      CX(MM1) = CX(MM1) + A11(J)*V1CX                                   PRB21810
      CY(MM1) = CY(MM1) + A11(J)*V1CY                                   PRB21820
      CZ(MM1) = CZ(MM1) + A11(J)*V1CZ                                   PRB21830
      CX(M) = CX(M) + A12(J)*V1CX                                       PRB21840
      CY(M) = CY(M) + A12(J)*V1CY                                       PRB21850
      CZ(M) = CZ(M) + A12(J)*V1CZ                                       PRB21860
      CX(MP1) = CX(MP1) + A13(J)*V1CX                                   PRB21870
      CY(MP1) = CY(MP1) + A13(J)*V1CY                                   PRB21880
      CZ(MP1) = CZ(MP1) + A13(J)*V1CZ                                   PRB21890
  190 IF (.NOT. PRIN3) GO TO 200                                        PRB21900
      WRITE (6, 290 ) (L,XRING(L),YRING(L),VOAXIX(L),VOAXIY(L),VOCRSX(L)PRB21910
     1,  VOCRSY(L),VOCRSZ(L),L=1,NI)                                    PRB21920
      WRITE (6, 280 ) V1AX,V1AY,V1CX,V1CY,V1CZ                          PRB21930
C                                                                       PRB21940
  200 IF (NOV2) GO TO 250                                               PRB21950
      IF (NOAXI) GO TO 220                                              PRB21960
      S = SO                                                            PRB21970
      DO 210 L = 1,NI                                                   PRB21980
      VOAXIX(L) = VOAXIX(L)*S                                           PRB21990
      VOAXIY(L) = VOAXIY(L)*S                                           PRB22000
  210 S = S + DS                                                        PRB22010
      CALL SIMSON (VOAXIX,NI,DS,V2AX)                                   PRB22020
      CALL SIMSON (VOAXIY,NI,DS,V2AY)                                   PRB22030
      AX(MM1) = AX(MM1) + A21(J)*V2AX                                   PRB22040
      AY(MM1) = AY(MM1) + A21(J)*V2AY                                   PRB22050
      AX(M) = AX(M) + A22(J)*V2AX                                       PRB22060
      AY(M) = AY(M) + A22(J)*V2AY                                       PRB22070
      AX(MP1) = AX(MP1) + A23(J)*V2AX                                   PRB22080
      AY(MP1) = AY(MP1)+ A23(J)*V2AY                                    PRB22090
C                                                                       PRB22100
  220 IF (NOCROS) GO TO 240                                             PRB22110
      S = SO                                                            PRB22120
      DO 230 L = 1,NI                                                   PRB22130
      VOCRSX(L) = VOCRSX(L)*S                                           PRB22140
      VOCRSY(L) = VOCRSY(L)*S                                           PRB22150
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```
      VOCRSZ(L) = VOCRSZ(L)*S                                           PRB22160
  230 S = S + DS                                                        PRB22170
      CALL SIMSON(VOCRSX,NI,DS,V2CX)                                    PRB22180
      CALL SIMSON(VOCRSY,NI,DS,V2CY)                                    PRB22190
      CALL SIMSON(VOCRSZ,NI,DS,V2CZ)                                    PRB22200
      CX(MM1) = CX(MM1) + A21(J)*V2CX                                   PRB22210
      CY(MM1) = CY(MM1) + A21(J)*V2CY                                   PRB22220
      CZ(MM1) = CZ(MM1) + A21(J)*V2CZ                                   PRB22230
      CX(M) = CX(M) + A22(J)*V2CX                                       PRB22240
      CY(M) = CY(M) + A22(J)*V2CY                                       PRB22250
      CZ(M) = CZ(M) + A22(J)*V2CZ                                       PRB22260
      CX(MP1) = CX(MP1) + A23(J)*V2CX                                   PRB22270
      CY(MP1) = CY(MP1) + A23(J)*V2CY                                   PRB22280
      CZ(MP1) = CZ(MP1) + A23(J)*V2CZ                                   PRB22290
C                                                                       PRB22300
  240 IF (.NOT. PRIN3) GO TO 250                                        PRB22310
      WRITE (6, 300 ) (L,XRING(L),YRING(L),VOAXIX(L),VOAXIY(L),VOCRSX(L)PRB22320
     1,  VOCRSY(L),VOCRSZ(L),L=1,NI)                                    PRB22330
      WRITE (6, 280 ) V2AX,V2AY,V2CX,V2CY,V2CZ                          PRB22340
C                                                                       PRB22350
C                                                                       PRB22360
250   IF(.NOT.PF)RETURN
      AX(J)=AXV(J)
      AY(J)=AYV(J)
      RETURN
C                                                                       PRB22380
  260 FORMAT(12H0PARAB2.  I=,I3,4H, J=,I3,5H, NI=,I3,5H, SC=,F10.5,     PRB22390
     1 5H, DS=,F10.6,7H, X(I)=,F10.5,7H, Y(I)=,F10.5)                   PRB22400
  270 FORMAT(4H0  L,7X,5HXRING,8X,5HYRING,10X,6HVOAXIX,7X,6HVOAXIY,     PRB22410
     1 10X,6HVOCRSX,7X,6HVOCRSY,7X,6HVOCRSZ,10X,6HVOVORX,7X,6HVOVORY//  PRB22420
     2 (1H ,I3,2F13.5,3X,2F13.6,3X,3F13.6,3X,2F13.6))                   PRB22430
  280 FORMAT(24H0RESULTS OF SIMPSON-RULE,9X,2F13.6,3X,3F13.6,3X,2F13.6, PRB22440
     1 /1H0)                                                            PRB22450
  290 FORMAT(4H0  L,7X,5HXRING,8X,5HYRING,10X,6HV1AXIX,7X,6HV1AXIY,     PRB22460
     1 10X,6HV1CRSX,7X,6HV1CRSY,7X,6HV1CRSZ,//(1H ,I3,2F13.5,3X,2F13.6, PRB22470
     2 3X,3F13.6))                                                      PRB22480
  300 FORMAT(4H0  L,7X,5HXRING,8X,5HYRING,10X,6HV2AXIX,7X,6HV2AXIY,     PRB22490
     1 10X,6HV2CRSX,7X,6HV2CRSY,7X,6HV2CRSZ,//(1H ,I3,2F13.5,3X,2F13.6, PRB22500
     2 3X,3F13.6))                                                      PRB22510
      END                                                               PRB22520
```

```
    1.      SUBROUTINE PARAB3
    2.      RETURN
    3.      END
```

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      SUBROUTINE PART1                                                  PRT1  21
C                                                                       PRT1  10
      OVERLAY (PAN,1,0)                                                        C
      PROGRAM PART1                                                            C
C                                                                       PRT1  30
C                 * CONTROL FOR BASIC DATA AND FORM MATRIX              PRT1  40
C                                                                       PRT1  50
        COMMON / NBSAVE /  NBOLD, NIN                                   PRT1  60
      COMMON       HEDR(10)   ,CASE       ,NB        ,NNU               PRT1  70
     1                 ,FLG03     ,FLG04     ,FLG05     ,FLG06     ,FLG07 PRT1  80
     2                 ,FLG08     ,FLG09     ,FLG10     ,FLG11     ,FLG12 PRT1  90
     3                 ,FLG13     ,FLG14     ,FLG15     ,FLG16     ,FLG17 PRT1 100
     4                 ,FLG18     ,FLG19     ,FLG20     ,FLG21     ,FLG22 PRT1 110
     5                 ,FLG23     ,FLG24     ,FLG25     ,FLG26     ,FLG27 PRT1 120
      COMMON   NT,        ND(11),     MN,        NUNA(5),   TYPEA(5),   PRT1 130
     1         NER1,      NER2,       NMA,       NSIGA,     NSIGC,      PRT1 140
     2         NUNC(5),   TYPEC(5), NLF(11),   IEC,        NSIGEC,      PRT1 150
     3          TYPEEC(5),NUNEC(5)                                      PRT1 160
      DOUBLE PRECISION  HEDR, CASE                                      PRT1 170
      INTEGER      FLG03      ,FLG04     ,FLG05     ,FLG06     ,FLG07   PRT1 180
     1                 ,FLG08     ,FLG09     ,FLG10     ,FLG11     ,FLG12 PRT1 190
     2                 ,FLG13     ,FLG14     ,FLG15     ,FLG16     ,FLG17 PRT1 200
     3                 ,FLG18     ,FLG19     ,FLG20     ,FLG21     ,FLG22 PRT1 210
     4                 ,FLG23     ,FLG24     ,FLG25     ,FLG26     ,FLG27 PRT1 220
      COMMON /IPSF/ PSF                                                 PRT1 230
      COMMON /P/ IPUVEL                                                 PRT1 240
      REAL         MN                                                   PRT1 250
C                                                                       PRT1 260
      COMMON /CL/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),  PRT1 270
     1               SINA(500),COSA(500),XP(500),   YP(500)             PRT1 280
     2              ,XWAKE(11),YWAKE(11)                                PRT1 290
      COMMON /TL/    TX1(500), TY1(500), NG(500),  TG(500),  ALFA(500), PRT1 300
     1               RSDS(500),DALF(500),                               PRT1 310
     2               CHORD,      TEMP(600),TCNST,     DUMMY(5915)       PRT1 320
      COMMON /PRINTF/ PRIN1,PRIN2,PRIN3                                 PRT1 330
      COMMON /BLOCKR/ NRAKES,RNAME(20,9),RAKEA(20),RUNITX(20),          PRT1 340
     1 RUNITY(20),RDS(20),NRPTS(20),COSTH(20),IRAKF,NOFF,X1R(20),       PRT1 350
     2 Y1R(20),X2R(20),Y2R(20)                                          PRT1 360
      COMMON /EPSBLK/ EPSLON
      COMMON  /RNGWNG/ VA(500,2),  VR(500,2),VAN(500), VAT(500)         MTRX 350
      COMMON /BLOCK1/ IGEOMF(9),ISIGF(9),IPNCHF,NONEW(9)                BAS1  70
      COMMON /BLOCK2/ HCURV(500),HARC(500)                              BAS1  80
      COMMON /BLOCK3/NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE,LSSE,SD,XYZ2 430
     1 NSMALL                                                           XYZ2 440
      COMMON /BLOCK4/A11(500),A12(500),A13(500),A21(500),A22(500),      MTRX  90
     1A23(500)                                                          MTRX 100
      LOGICAL PRIN1,PRIN2,PRIN3                                         PRT1 370
      INTEGER      BDN         ,SUBKS                                   PRT1 380
      REAL         MX          ,MY         ,NG                          PRT1 390
C                                                                       PRT1 400
C                 * START                                               PRT1 410
C                 * READ INPUT DATA                                     PRT1 420
   10 READ (5, 50 ,END= 590 ) HEDR,CASE,PSF,NB,NNU,FLG03,FLG04,FLG05,FLGPRT1 431
C  10 READ (5, 50 )           HEDR,CASE,PSF,NB,NNU,FLG03,FLG04,FLG05,FLGPRT1 43C
     106,               FLG07, FLG08, FLG09, FLG10, FLG11, FLG12, FLG13, PRT1 440
     2FLG14,            FLG15, FLG16, FLG17, FLG18, FLG19, FLG20, FLG21, PRT1 450
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     3FLG22,          FLG23, FLG24, FLG25, FLG26, FLG27, IPUVEL, NIN,IPPRT1 460
     4RIN1,  IPRIN2,IPRIN3,IRAKF                                        PRT1 470
      IPUVEL=1
C     IF (EOF(5)) 590,11                                                   C
   11 CONTINUE
      PRIN1 = .FALSE.                                                   PRT1 480
      IF (IPRIN1 .EQ. 1) PRIN1 = .TRUE.                                 PRT1 490
      PRIN2 = .FALSE.                                                   PRT1 500
      IF (IPRIN2 .EQ. 1) PRIN2 = .TRUE.                                 PRT1 510
      PRIN3 = .FALSE.                                                   PRT1 520
      IF (IPRIN3 .EQ. 1) PRIN3 = .TRUE.                                 PRT1 530
C**** ***TRIANGULARIZATION OF THE MATRIX (SOLVIT) IS THE DEFAULT SOLUTIONPRT1 540
      IF(FLG09.EQ.0.AND.FLG10.EQ.0)FLG13=1                              PRT1 550
C****  ***FLG22 IS GENERATED (RESEP) BOUNDARY CONDITIONS                 PRT1 560
C****  ***FLG21 IS EXTRA CROSS FLOW                                      PRT1 570
      IF (FLG22.LE.0)GO TO 20                                           PRT1 580
      FLG21 = 1                                                         PRT1 590
      FLG03 = 1                                                         PRT1 600
      FLG04 = 1                                                         PRT1 610
C****  ***IF FLAG 18 IS NOT EQUAL TO FLAG 14 YOU MUST USE DIRECT MATRIX PRT1 620
   20 IF (FLG18.NE.FLG14)GO TO 30                                       PRT1 630
      IF (FLG21.LE.0)GO TO 40                                           PRT1 640
      FLG12 = 1                                                         PRT1 650
   30 FLG13 = 1                                                         PRT1 660
      FLG09 = 0                                                         PRT1 670
      FLG10 = 0                                                         PRT1 680
   40 CONTINUE                                                          PRT1 690
        IF( NBOLD .EQ. 0 )        NBOLD = NB                            PRT1 700
C**** ***CARDS (UNIT 5) ARE THE DEFAULT METHOD OF INPUT                  PRT1 710
        IF( NIN .EQ. 0 )       NIN = 5                                  PRT1 720
   50 FORMAT ( 10A6, 3X A6, 7X A4/ 28I1, I2,4I1)
      READ (5, 60 ) CHORD, MN, TCNST, EPSLON                            PRT1 740
   60 FORMAT ( 4F10.0 )                                                 PRT1 750
C**** ***THE DEFAULT CHORD LENGTH IS 1.0                                  PRT1 760
      IF(CHORD.GT.-1.0E-5.AND.CHORD.LT.1.0E-5)CHORD=1.0                 PRT1 770
      WRITE (6, 70 ) HEDR, CASE, NB, NNU, CHORD, MN, TCNST, EPSLON, PSF PRT1 780
   70 FORMAT ( 1H1 25X, 26HDOUGLAS  AIRCRAFT COMPANY /                  PRT1 790
     1          28X, 21HLONG  BEACH  DIVISION ///                       PRT1 800
     2 6X,52HPROGRAM EODF -- PARABOLIC AXISYMMETRIC AND CROSSFLOW ,//   PRT1 810
     3          11X, 29H***** CASE CONTROL DATA ***** ///               PRT1 820
     4             6X, 10A6, 4X, 10HCASE NO.  A6 //                     PRT1 830
     5             6X  9HBODIES  =I3/ 6X 9HNNU     =I3/ 6X 9HCHORD   =F12.7/PRT1 840
     6             6X  9HMACH NO.=F12.8/ 6X 9HTCNST   =F12.7/           PRT1 850
     7             6X,8HEPSLON =,F12.7,/6X,9HPSF NO. =, A4///)
      IF (FLG03.GT.0) WRITE (6, 80 )                                    PRT1 870
   80 FORMAT (13X 21HSURFACE OF REVOLUTION )                            PRT1 880
      IF (FLG04.GT.0) WRITE (6, 90 )                                    PRT1 890
   90 FORMAT (13X  9HCROSSFLOW)                                         PRT1 900
      IF (FLG05.GT.0) WRITE (6, 100 )                                   PRT1 910
  100 FORMAT (13X 15HOFF-BODY POINTS )                                  PRT1 920
      IF (FLG06.GT.0) WRITE (6, 110 )                                   PRT1 930
  110 FORMAT (13X 15HBASIC DATA ONLY )                                  PRT1 940
      IF (FLG07.GT.0) WRITE (6, 120 )                                   PRT1 950
  120 FORMAT (13X 17HELLIPSE GENERATOR )                                PRT1 960
      IF (FLG08.GT.0) WRITE (6, 130 )                                   PRT1 970
  130 FORMAT (13X 14HPRINT MATRICES )                                   PRT1 980
      IF (FLG09.GT.0) WRITE (6, 140 )                                   PRT1 990
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      140 FORMAT (13X 10HOLD SEIDEL )                                  PRT11000
          IF (FLG10.GT.0) WRITE (6, 150 )                              PRT11010
      150 FORMAT(13X,31HMODIFIED SEIDEL MATRIX SOLUTION)               PRT11020
          IF (FLG11.GT.0) WRITE (6, 160 )                              PRT11030
      160 FORMAT (13X 18HPERTURBATIONS ONLY )                          PRT11040
          IF (FLG12.GT.0) WRITE (6, 170 )                              PRT11050
      170 FORMAT (13X 22HSOLVE POTENTIAL MATRIX )                      PRT11060
          IF (FLG13.GT.0) WRITE (6, 180 )                              PRT11070
      180 FORMAT (13X 47HMATRIX SOLUTION BY TRIANGULARIZATION   (SOLVIT)) PRT11080
          IF (FLG14.GT.0) WRITE (6, 190 )                              PRT11090
      190 FORMAT ( 13X 30HPRESCRIBED TANGENTIAL VELOCITY )             PRT11100
          IF (FLG18.GT.0) WRITE (6, 200 )                              PRT11110
      200 FORMAT ( 15X 22HWITH SURFACE VORTICITY )                     PRT11120
          IF (FLG15.GT.0) WRITE (6, 210 )                              PRT11130
      210 FORMAT (13X 12HSTRIP VORTEX )                                PRT11140
          IF (FLG16.GT.0) WRITE (6, 220 )                              PRT11150
      220 FORMAT (13X 40HOMIT AXI-SYMMETRIC UNIFORM FLOW SOLUTION )    PRT11160
          IF (FLG17.GT.0) WRITE (6, 230 )                              PRT11170
      230 FORMAT (13X 36HOMIT CROSSFLOW UNIFORM FLOW SOLUTION )        PRT11180
          IF (FLG19.GT.0) WRITE (6, 240 )                              PRT11190
      240 FORMAT (13X 20HPRESCRIBED VORTICITY)                         PRT11200
          IF (FLG20 .GT. 0)WRITE(6, 250 )                              PRT11210
      250 FORMAT(13X 15HTOTAL VORTICITY  )                             PRT11220
          IF (FLG21 .GT. 0)WRITE(6, 260 )                              PRT11230
      260 FORMAT ( 13X  16HEXTRA CROSS FLOW )                          PRT11240
          IF (FLG22 .GT. 0)WRITE(6, 270 )                              PRT11250
      270 FORMAT(13X 62HGENERATED BOUNDARY CONDITIONS FOR 3 AXISYMMETRIC, 1 PRT11260
         1CROSS, AND 1 EXTRA CROSS FLOW.  )                            PRT11270
          IF (FLG23 .LE. 0)GO TO 290                                   PRT11280
          WRITE(6, 280 )                                               PRT11290
      280 FORMAT(13X 16HRING WING OPTION )                             PRT11300
          FLG03 = 1                                                    PRT11310
          FLG13 = 1                                                    PRT11320
          FLG15 = 1                                                    PRT11330
          FLG19 = 1                                                    PRT11340
      290 IF (FLG19 .GT. 0)FLG18 = 1                                   PRT11350
          IF (FLG22.GT.0.AND.NB.NE.2) GO TO 300                        PRT11360
          GO TO 320                                                    PRT11370
      300 WRITE(6, 310 )                                               PRT11380
      310 FORMAT (128H0 WHEN GENERATED RESEP BOUNDARY CONDITIONS ARE USED,NUPRT11390
         1MBER OF BODIES MUST BE EXACTLY TWO.   YOU GOOFED.   EXECUTION TERMPRT11400
         2INATING.)                                                    PRT11410
          STOP                                                         PRT11420
      320 IF (FLG22.GT.0.AND.NNU.GT.0)GO TO 330                        PRT11430
          GO TO 350                                                    PRT11440
      330 WRITE (6, 340 )                                              PRT11450
      340 FORMAT (98H0 GENERATED RESEP BOUNDARY CONDITIONS CANNOT HAVE NON-UPRT11460
         1NIFORM FLOW INPUT.   EXECUTION TERMINATING.)                  PRT11470
      350 IF (IPUVEL.NE.0)WRITE (6, 360 )                              PRT11480
      360 FORMAT (13X 14HPUNCHED OUTPUT)                               PRT11490
           WRITE ( 6, 370 )  NIN                                       PRT11500
          IF (FLG18.LE.0.OR.FLG14.GT.0) GO TO 390                      PRT11510
      370  FORMAT( 13X,58HINPUT TAPE NO. FOR COORDINATES AND NON-UNIFORM FLOPRT11520
         1W ONLY = , I5    )                                           PRT11530
          WRITE (6, 380 )                                              PRT11540
      380 FORMAT (1H0//63H FLG14 MUST BE USED WITH FLG18 OR FLG19.  EXECUTIOPRT11550
         1N TERMINATED. )                                              PRT11560
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      STOP
  390 IF (NNU.LE.0.OR.FLG14.LT.0) GO TO 410
      WRITE (6, 400 )
  400 FORMAT (1H0// 49H COLUMNS 2 AND 14 OF FLAG CARD ARE BOTH NON-ZERO.
     1               / 43H ILLEGAL COMBINATION. EXECUTION TERMINATED. )
      STOP
C                    * READ DATA AND SETUP FOR UNIFORM FLOW
  410 IF (IRAKE .EQ. 1) WRITE (6, 600 )
      CALL BASIC1
C*** ***NSIGA AND NSIGC ULTIMATELY BECOME THE NUMBER OR RIGHT HAND SIDES
C*** ***IN AXISYMMETRIC FLOW AND CROSS FLOW RESPECTIVELY
      NSIGA=0
      IF (FLG03.GT.0.AND.FLG16.LE.0) NSIGA=1
      NSIGC=0
      IF (FLG04.GT.0.AND.FLG17.LE.0) NSIGC=1
      IF (FLG22.GT.0) GO TO 430
      DO 420 I = 1,5
      NUNA(I) = 123456
  420 TYPEA(I) = 100.
      IF(FLG23 .GT. 0)GO TO 450
      GO TO 480
C***   ***PREPARE NUNA AND TYPEA FOR NON-UNIFORM AXISYMMETRIC FLOW,GENER
C***   ***(RESEP) BOUNDARY CONDITIONS
  430 DO 440 I = 1,3
      NUNA(I) = I
  440 TYPEA(I) = 100.0
      GO TO 480
C
C
C   ***   RING WING OPTION
C   ***   STRIP VORTEX FLOWS ALREADY HAVE NUNA(I) = 123456.
C   ***   MAKE PRESCRIBED VORTICITY FLOWS NUNA(J) = TO THEIR FLOW NO.   J
C
  450 ICNT = 0
      DO 460 I = 1,NB
      IF(NLF(I) .GT. 0) GO TO 460
      ICNT = ICNT + 1
  460 CONTINUE
C
C   ***   ICNT IS THE NUMBER OF LIFTING BODIES
C   ***   NUMBER OF FLOWS IS 2 * ICNT  + 1
C
      NFLOWS = 2 * ICNT + 1
      ICNTP2 = ICNT + 2
      DO 470 I = ICNTP2,NFLOWS
  470 NUNA(I) = I
  480 CONTINUE
C*** ***IF FLG02 (NON-UNIFORM FLOW) IS NOT CHECKED INITIALLY, THE FLOW
C*** ***OF CONTROL WILL NEVER REACH BASIC2
      IF (NNU) 490 , 500 , 490
C                    * READ DATA AND SETUP FOR NON-UNIFORM FLOW
  490 CALL BASIC2
  500 CONTINUE
      REWIND 4
      IF (NSIGA .LE. 5 )GO TO 530
  510 WRITE(6, 520 )
  520 FORMAT (1H1 75HAXI-SYMMETRIC OR CROSSFLOW NON-UNIFORM FLOWS EXCEED
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     1 5. EXECUTION TERMINATED  )                                      PRT12140
      STOP                                                              PRT12150
  530 IF (NSIGC .GT. 5)GO TO 510                                        PRT12160
      IF (FLG15.LE.0.OR.FLG03.GT.0) GO TO 550                           PRT12170
      WRITE (6, 540 )                                                   PRT12180
  540 FORMAT (64H1STRIP RING VORTEX OPTION MUST USE SURFACE OF REVOLUTIOPRT12190
     1N OPTION. / 22H EXECUTION TERMINATED. )                           PRT12200
      STOP                                                              PRT12210
  550 IF (FLG15.LE.0) GO TO 580                                         PRT12220
      J = 0                                                             PRT12230
      DO 560 I = 1, NB                                                  PRT12240
  560 IF (NLF(I).LE.0) J=J+1                                            PRT12250
      IF (NSIGA + J  .LE.  5 )GO TO 580                                 PRT12260
      WRITE (6, 570 )                                                   PRT12270
  570 FORMAT (68H1GENERATED STRIP VORTEX ONSET FLOWS (ONE FOR EACH LIFTIPRT12280
     1NG BODY) PLUS / 34H INPUT NON-UNIFORM FLOWS EXCEED 5. /           PRT12290
     2 22H0EXECUTION TERMINATED. )                                      PRT12300
      STOP                                                              PRT12310
  580 IF (FLG06.NE.0) GO TO 10                                          PRT12320
      CALL MATRIX                                                       PRT12330
      GO TO 595                                                         PRT12340
  590 WRITE (6, 610 )                                                   PRT12350
      STOP                                                              PRT12360
  595 RETURN                                                                   I
C 595 CONTINUE                                                                 C
  600 FORMAT(13X,'AUTOMATIC RAKE GENERATION')                           PRT12370
  610 FORMAT(55H0NO ADDITIONAL CASES INPUT. NORMAL PROGRAM TERMINATION.)PRT12380
      END                                                               PRT12390
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      SUBROUTINE PART2                                                  PRT2  21
C                                                                       PRT2  10
C     OVERLAY (PAN,2,0)                                                        C
C     PROGRAM PART2                                                            C
C                                                                       PRT2  30
C                * COMPUTE SOURCE DENSITY SIGMA BY SIEDEL ITERATION     PRT2  40
C                                                                       PRT2  50
      COMMON       HEDR(10)  ,CASE      ,NB        ,NNU                 PRT2  60
     1             ,FLG03    ,FLG04     ,FLG05     ,FLG06     ,FLG07    PRT2  70
     2             ,FLG08    ,FLG09     ,FLG10     ,FLG11     ,FLG12    PRT2  80
     3             ,FLG13    ,FLG14     ,FLG15     ,FLG16     ,FLG17    PRT2  90
     4             ,FLG18    ,FLG19     ,FLG20     ,FLG21     ,FLG22    PRT2 100
     5             ,FLG23    ,FLG24     ,FLG25     ,FLG26     ,FLG27    PRT2 110
      COMMON    NT,       ND(11),    MN,      NUNA(5),  TYPEA(5),       PRT2 120
     1          NER1,     NER2,      NMA,     NSIGA,    NSIGC,          PRT2 130
     2          NUNC(5),  TYPEC(5),  NLF(11), TEC,      NSIGEC,         PRT2 140
     3          TYPEFC(5),NUNEC(5)                                      PRT2 150
      DOUBLE PRECISION  HEDR, CASE                                      PRT2 160
      INTEGER      FLG03     ,FLG04     ,FLG05     ,FLG06     ,FLG07    PRT2 170
     1             ,FLG08    ,FLG09     ,FLG10     ,FLG11     ,FLG12    PRT2 180
     2             ,FLG13    ,FLG14     ,FLG15     ,FLG16     ,FLG17    PRT2 190
     3             ,FLG18    ,FLG19     ,FLG20     ,FLG21     ,FLG22    PRT2 200
     4             ,FLG23    ,FLG24     ,FLG25     ,FLG26     ,FLG27    PRT2 210
      REAL         MN                                                   PRT2 220
C                                                                       PRT2 230
      COMMON /C2/    A(500),   R(500,4),      NSIG,      IT             PRT2 240
C                                                                       PRT2 250
      DIMENSION      ASIG(500,4),   CSIG(500,4),         T(500)         PRT2 260
C                                                                       PRT2 270
C                * START                                                PRT2 280
      IF (FLG03.EQ.0) GO TO 80                                          PRT2 290
C                * AXIS FLOW                                            PRT2 300
      L=0                                                               PRT2 310
      READ (4) (T(I),I=1,NT)                                            PRT2 320
      IF (FLG16.NE.0) GO TO 20                                          PRT2 330
      L=L+1                                                             PRT2 340
      DO 10  I = 1, NT                                                  PRT2 350
   10 R(I,L) = T(I)                                                     PRT2 360
   20 IF (NNU) 60 , 60 , 30                                             PRT2 370
   30 DO 50  J = 1, NNU                                                 PRT2 380
C                * READ NON-UNIFORM ND * SKIP TO                        PRT2 390
      READ (4) MS,(T(I),I=1,NT)                                         PRT2 400
      IF (MS.EQ.1) GO TO 50                                             PRT2 410
      L=L+1                                                             PRT2 420
      DO 40  I = 1, NT                                                  PRT2 430
   40 R(I,L) = T(I)                                                     PRT2 440
   50 CONTINUE                                                          PRT2 450
   60 REWIND 4                                                          PRT2 460
      IT = 9                                                            PRT2 470
      NSIG = NSIGA                                                      PRT2 480
C                * SOLVE SIMULTANEOUS EQUATIONS FOR SIGMAS              PRT2 490
      CALL MISNA2 (ASIG)                                                PRT2 500
      REWIND 9                                                          PRT2 510
      IF (FLG04.GT.0) GO TO 80                                          PRT2 520
C                * WRITE SIGMAS ON TAPE 3                               PRT2 530
      DO 70  J = 1, NSIGA                                               PRT2 540
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   70 WRITE (3) (ASIG(I,J), I = 1, NT)                          PRT2 550
      GO TO 180                                                 PRT2 560
C                  * CROSS FLOW                                 PRT2 570
   80 L = 0                                                     PRT2 580
      READ (4) (T(I),I=1,NT),(T(I),I=1,NT)                      PRT2 590
      IF (FLG17.NE.0) GO TO 100                                 PRT2 600
      L = L+1                                                   PRT2 610
      DO 90  I = 1, NT                                          PRT2 620
   90 R(I,L) = -T(I)                                            PRT2 630
  100 IF (NNU) 140 , 140 , 110                                  PRT2 640
  110 DO 130  J = 1, NNU                                        PRT2 650
      READ (4) MS,(T(I),I=1,NT)                                 PRT2 660
      IF (MS.LE.0) GO TO 130                                    PRT2 670
      L = L+1                                                   PRT2 680
      DO 120  I = 1, NT                                         PRT2 690
  120 R(I,L) = T(I)                                             PRT2 700
  130 CONTINUE                                                  PRT2 710
  140 REWIND 4                                                  PRT2 720
      IT = 10                                                   PRT2 730
      NSIG = NSIGC                                              PRT2 740
C                  * SOLVE SIMULTANEOUS EQUATIONS FOR SIGMAS    PRT2 750
      CALL MISNA2 (CSIG)                                        PRT2 760
      REWIND 10                                                 PRT2 770
      IF (FLG03.LE.0) GO TO 160                                 PRT2 780
C                  * WRITE SIGMAS ON TAPE 3                     PRT2 790
      DO 150  J = 1, NSIGA                                      PRT2 800
  150 WRITE (3) (ASIG(I,J),I=1,NT)                              PRT2 810
  160 DO 170  J = 1, NSIGC                                      PRT2 820
  170 WRITE (3) (CSIG(I,J),I=1,NT)                              PRT2 830
  180 RETURN                                                    PRT2 841
C 180 CONTINUE                                                         C
      END                                                       PRT2 850
```

```
      SUBROUTINE PART4                                                  PRT4  21
C                                                                       PRT4  10
C     OVERLAY (PAN,4,0)                                                        C
C     PROGRAM PART4                                                            C
C                                                                       PRT4  30
C                 * COMPUTE VELOCITY COMPONENTS AND PRINT               PRT4  40
C                                                                       PRT4  50
      COMMON /BLOCK?/ HCURV(500),HAPC(500)
      COMMON/CURVPR/ IEL2
      COMMON      HEDR(10)  ,CASE      ,NB       ,NNU                   PRT4  60
     1              ,FLG03    ,FLG04    ,FLG05    ,FLG06    ,FLG07      PRT4  70
     2              ,FLG08    ,FLG09    ,FLG10    ,FLG11    ,FLG12      PRT4  80
     3              ,FLG13    ,FLG14    ,FLG15    ,FLG16    ,FLG17      PRT4  90
     4              ,FLG18    ,FLG19    ,FLG20    ,FLG21    ,FLG22      PRT4 100
     5              ,FLG23    ,FLG24    ,FLG25    ,FLG26    ,FLG27      PRT4 110
      COMMON   NI,        ND(11),    MN,       NUNA(5),  TYPEA(5),      PRT4 120
     1         NER1,      NER2,      NMA,      NSIGA,    NSIGC,         PRT4 130
     2         NUNC(5),   TYPEC(5),  NLF(11),  ICC,      NSIGEC,        PRT4 140
     3         TYPEEC(5),NUNEC(5)                                       PRT4 150
      DOUBLE PRECISION  HEDR, CASE                                      PRT4 160
      COMMON /COMBIN/CHAY(2)                                            PRT4 170
      INTEGER       FLG03    ,FLG04    ,FLG05    ,FLG06    ,FLG07       PRT4 180
     1              ,FLG08    ,FLG09    ,FLG10    ,FLG11    ,FLG12      PRT4 190
     2              ,FLG13    ,FLG14    ,FLG15    ,FLG16    ,FLG17      PRT4 200
     3              ,FLG18    ,FLG19    ,FLG20    ,FLG21    ,FLG22      PRT4 210
     4              ,FLG23    ,FLG24    ,FLG25    ,FLG26    ,FLG27      PRT4 220
      REAL          MN                                                  PRT4 230
C                                                                       PRT4 240
      COMMON /C4/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),  PRT4 250
     1              SINA(500),COSA(500),XP(500),  YP(500)               PRT4 260
      COMMON /TC/   RB(500,10),      SIG(500,5),     A(500),   B(500),  PRT4 270
     1              Z(500),          PHI(500,5),     XN(500,5),T(500,5),PRT4 280
     2              T3(500,5),       NSIG,           NP,       NI,      PRT4 290
     3              SUMV,            SUMH(5)                            PRT4 300
C                                                                       PRT4 310
C                 * START                                               PRT4 320
      DO 10 J = 1,10                                                    PRT4 330
      DO 10 I = 1,500                                                   PRT4 340
   10 RB(I,J) = 0.0                                                     PRT4 350
      REWIND 3                                                          PRT4 360
      IF (FLG05.EQ.0) GO TO 20                                          PRT4 370
C                 * READ OFF-BODY XP,YP                                 PRT4 380
      NP=ND(NB+1)                                                       PRT4 390
      READ (12) (XP(I),I=1,NP),(YP(I),I=1,NP)                           PRT4 400
C                 * READ X1,Y1,X2,Y2,DELS WITH MACH NO. ADJUSTMENT IF ANY PRT4 410
   20 NI=NT+NB                                                          PRT4 420
      READ (12)  (X1(I),I=1,NI),(Y1(I),I=1,NI),(X2(I),I=1,NT)          PRT4 430
     1          ,(Y2(I),I=1,NT),(DELS(I),I=1,NT)                        PRT4 440
C                 * READ SINA,COSA,NO,TO..                              PRT4 450
      READ (4) (A(I),I=1,NT),(B(I),I=1,NT)                              PRT4 460
      NMAP1 = NMA + 1                                                   PRT4 470
      IF(FLG23 .GT. 0)READ(4)(Z(I),I=NMAP1,NT)                          PRT4 480
      SUMV = 0.0                                                        PRT4 490
      DO 30  I = 1, NT                                                  PRT4 500
      SINA(I) = A(I)                                                    PRT4 510
      COSA(I) = B(I)                                                    PRT4 520
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```
   30 SUMV = SUMV + B(I)*DELS(I)*Y2(I)**2
      SUMV = SUMV*3.141593
      IF (FLG03.LE.0) GO TO 110
      L = 1
      LS = 0
      IF (FLG16.NE.0) GO TO 50
      DO 40  I = 1, NT
      RB(I,L) = A(I)
   40 RB(I,L+1) = B(I)
   50 IF (NNU) 100 , 100 , 60
   60 DO 80  J = 1, NNU
      READ (4) MS,(A(I),I=1,NT),(B(I),I=1,NT)
      IF (MS.EQ.1.OR.MS.EQ.2.OR.MS.EQ.5) GO TO 80
      L = L+2
      LS = LS+1
      IF (LS.EQ.1.AND.FLG16.GT.0) L=L-2
      DO 70  I = 1, NT
      RB(I,L) = A(I)
   70 RB(I,L+1) = B(I)
   80 CONTINUE
      IF(FLG23 .LE. 0)GO TO 100
      IPV = NB - FLG14 + 1
      NN = NNA
      DO 90  KCNT = IPV,NB
      L = L + 2
      NN = NN + ND(KCNT) - 1
C   ***   READ NOTS COLUMNS OF RHS
      READ(4)(RB(I,L),I=1,NT),(RB(I,L+1),I=1,NT)
C   ***   MULTIPLY NOTS COLUMN BY LAST INPUT PV ON THAT BODY
      DO 90  I=1,NT
      RB(I,L) = RB(I,L) * Z(NN)
   90 RB(I,L+1) = RB(I,L+1) * Z(NN)
  100 REWIND 4
      NSIG = NSIGA
      IF(FLG23 .GT. 0)NSIG = 2.0 * NSIG - 1
      CALL AXIS
  110 IF (FLG04.LE.0) GO TO 190
      IF (FLG03.LE.0) GO TO 120
      READ (4) (A(I),I=1,NT),(B(I),I=1,NT)
  120 L = 1
      LS=0
      IF (FLG17.NE.0) GO TO 140
      DO 130  I = 1, NT
      RB(I,L) = A(I)
  130 RB(I,L+1) = B(I)
  140 IF (NNU) 180 , 180 , 150
  150 DO 170  J = 1, NNU
      READ (4) MS,(A(I),I=1,NT),(B(I),I=1,NT)
      IF ( MS.EQ.0.OR.MS.EQ.2.OR.MS.EQ.4) GO TO 170
      L = L+2
      LS=LS+1
      IF (LS.EQ.1.AND.FLG17.GT.0) L=L-2
      DO 160  I = 1, NT
      RB(I,L) = A(I)
  160 RB(I,L+1) = B(I)
  170 CONTINUE
  180 REWIND 4
```

```
      NSIG = NSIGC                                                      PRT41100
      CALL CROSS                                                        PRT41110
  190 IF (FLG21 .LE. 0) GO TO  220                                      PRT41120
      REWIND 4                                                          PRT41130
      IF(FLG22.GT.0) GO TO 210                                          PRT41140
      L = 0                                                             PRT41150
C***   ***IF CONTROL REACHES THIS POINT, THERE IS AT LEAST  1 NNU       PRT41160
C***   ***SKIP RECORD WITH SIN AND COS                                  PRT41170
      READ (4)                                                          PRT41180
      DO 200  J = 1,NNU                                                 PRT41190
      READ(4) MS, ( A(I),I=1,NT ), ( B(I),I=1,NT )                      PRT41200
      L = L + 1                                                         PRT41210
      DO 200  I = 1,NT                                                  PRT41220
      RB(I,L) = A(I)                                                    PRT41230
  200 RB(I,L+1) = B(I)                                                  PRT41240
  210 REWIND 4                                                          PRT41250
      NSIG = NSIGEC                                                     PRT41260
C***   ***CALL TO EXCROS FOR GENERATED (PESEP) BOUNDARY CONDITIONS      PRT41270
      CALL EXCROS                                                       PRT41280
220   WRITE(7,231) IEL2
231   FORMAT(I8)
      WRITE(7,230) (HCURV(II),II=1,IEL2)
230   FORMAT(4E13.8)
      RETURN
C 220 CONTINUE                                                                 C
      END                                                               PRT41300
```

```
      SUBROUTINE  PREP                                                   PREP  21
C                                                                        PREP  10
C     OVERLAY (PAN,3,0)                                                         C
C     PROGRAM PREP                                                              C
C **               * PREPARE TAPES 3 AND 11 FOR USE BY LINK 5 (MATSOL)   PREP  30
      COMMON/SPACER/WKAREA(16000)                                        PREP  40
      DIMENSION TEMP(505), Y2(500)                                       PREP  50
      COMMON       HEDR(10)  ,CASE      ,NB        ,NNU                  PREP  60
     1                  ,FLG03    ,FLG04     ,FLG05     ,FLG06     ,FLG07 PREP  70
     2                  ,FLG08    ,FLG09     ,FLG10     ,FLG11     ,FLG12 PREP  80
     3                  ,FLG13    ,FLG14     ,FLG15     ,FLG16     ,FLG17 PREP  90
     4                  ,FLG18    ,FLG19     ,FLG20     ,FLG21     ,FLG22 PREP 100
     5                  ,FLG23    ,FLG24     ,FLG25     ,FLG26     ,FLG27 PREP 110
      COMMON   NT,      ND(11),   MN,       NUNA(5),  TYPEA(5),          PREP 120
     1         NER1,    NER2,     NMA,      NSIGA,    NSIGC,             PREP 130
     2         NUNC(5), TYPEC(5), NLF(11),  IEC,      NSIGFC,            PREP 140
     3         TYPEEC(5),NUNEC(5)                                        PREP 150
      DOUBLE PRECISION  HEDR, CASE                                       PREP 160
      INTEGER        FLG03    ,FLG04     ,FLG05     ,FLG06     ,FLG07    PREP 170
     1                  ,FLG08    ,FLG09     ,FLG10     ,FLG11     ,FLG12 PREP 180
     2                  ,FLG13    ,FLG14     ,FLG15     ,FLG16     ,FLG17 PREP 190
     3                  ,FLG18    ,FLG19     ,FLG20     ,FLG21     ,FLG22 PREP 200
     4                  ,FLG23    ,FLG24     ,FLG25     ,FLG26     ,FLG27 PREP 210
      REAL           MN                                                  PREP 220
      DIMENSION COSSOR(500), RHS(500)                                    PREP 230
      DIMENSION      A(505),   R(500,5),  FF(500),  T(500)               PREP 240
      DATA  FOURPI/12.5663706/                                           PREP 250
C***    ***AXISYMMETRIC FLOW ONLY                      MS = 0            PREP 260
C***    ***CROSS FLOW ONLY                             MS = 1            PREP 270
C***    ***EXTRA CROSS FLOW ONLY                       MS = 2            PREP 280
C***    ***AXISYMMETRIC AND CROSS FLOW                 MS = 3            PREP 290
C***    ***AXISYMMETRIC AND EXTRA CROSS FLOW           MS = 4            PREP 300
C***    ***CROSS AND EXTRA CROSS FLOW                  MS = 5            PREP 310
C***    ***AXISYMMETRIC,CROSS, AND EXTRA CROSS FLOW  MS = 6              PREP 320
      IF(FLG12.EQ.0.OR.(FLG04.EQ.0.AND.FLG21.EQ.0) ) GO TO 20            PREP 330
      IF (FLG05.EQ.0) GO TO 10                                           PREP 340
C***    ***SKIP OFF BODY COORDINATES                                     PREP 350
      READ(12)                                                           PREP 360
   10 NT=NT+NB                                                           PREP 370
      READ(12) (TEMP(I),I = 1,NT),(TEMP(I),I = 1,NT),                    PREP 380
     1   (TEMP(I),I = 1,NT), (Y2(I),I = 1,NT)                            PREP 390
      REWIND 12                                                          PREP 400
   20 REWIND 3                                                           PREP 410
      IF (FLG03) 30 , 230 , 30                                           PREP 420
C **               * PREPARE AXISYMMETRIC MATRIX TAPE (3)                PREP 430
   30 IF (FLG19.GT.0) GO TO 530                                          PREP 440
      IF ( FLG22.GT.0) GO TO 140                                         PREP 450
      K = 0                                                              PREP 460
      L = NT+NSIGA                                                       PREP 470
      READ (4) (A(I),I=1,NT),(FF(I),I=1,NT)                              PREP 480
      IF (FLG16.NE.0) GO TO 50                                           PREP 490
      K = K+1                                                            PREP 500
      DO 40 I = 1, NT                                                    PREP 510
   40 R(I,K) = A(I)                                                      PREP 520
   50 IF (NNU) 90 , 90 , 60                                              PREP 530
   60 DO 80 J = 1, NNU                                                   PREP 540
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      READ (4) MS,(A(I),I=1,NT)                                         PREP 550
      IF (MS.EQ.1.OR.MS.EQ.2.OR.MS.EQ.5) GO TO 80                       PREP 560
      K = K+1                                                           PREP 570
      DO 70 I = 1, NT                                                   PREP 580
   70 R(I,K) = A(I)                                                     PREP 590
   80 CONTINUE                                                          PREP 600
   90 IF (FLG14.LE.0) GO TO 170                                         PREP 610
      NR= NMA+1                                                         PREP 620
      READ (4) (R(I,1), I=NR,NT)                                        PREP 630
      REWIND 4                                                          PREP 640
      DO 100 I = NR, NT                                                 PREP 650
  100 R(I,1) = R(I,1)-FF(I)                                             PREP 660
      IF (FLG14.EQ.NB) GO TO 120                                        PREP 670
      DO 110 I = 1, NMA                                                 PREP 680
      READ (9) (A(J),J=1,NT)                                            PREP 690
      A(NT+1) =  R(I,1)                                                 PREP 700
  110 WRITE (3) (A(J),J=1,L)                                            PREP 710
  120 DO 130 I = NR, NT                                                 PREP 720
      READ (9) (A(J),J=1,NT),(A(J),J=1,NT)                              PREP 730
      A(NT+1) =  R(I,1)                                                 PREP 740
  130 WRITE (3) (A(J),J=1,L)                                            PREP 750
C  PRESCRIBED TANGENTIAL VELOCITY      INPUT TO SOLVIT ON TAPE 3        PREP 760
C                                      OUTPUT FROM SOLVIT  ON TAPE 3    PREP 770
C  TAPES 1 AND 2 ARE SCRATCH TAPES                                      PREP 780
      CALL SOLVIT(WKAREA,NT,NSIGA,16000,3,14,2,3)
      REWIND 9                                                          PREP 800
      GO TO 230                                                         PREP 810
C***   ***AXISYMMETRIC FLOW   *   GENERATED (RESEP) BOUNDARY CONDITIONS PREP 820
C***   ***NPB1 = THE NUMBER OF ELEMENTS ON BODY 1                       PREP 830
C***   ***NPB2 = THE NUMBER OF ELEMENTS ON BODY 2                       PREP 840
  140 NPB1 = ND(1) - 1                                                  PREP 850
      NPB2 = ND(2) - 1                                                  PREP 860
      NSIGA = 3                                                         PREP 870
      NSIGC = 1                                                         PREP 880
      NSIGEC = 1                                                        PREP 890
      L = NT + NSIGA                                                    PREP 900
C***   ***L IS THE TOTAL  WIDTH OF THE MATRIX FOR AXISYMMETRIC FLOW INCLPREP 910
C***   ***RIGHT HAND SIDES                                              PREP 920
      READ (4)                                                          PREP 930
      READ(4) ( COSSQR(I),I = 1,NPB1), (RHS(I),I = 1,NPB1 )             PREP 940
      REWIND 4                                                          PREP 950
      DO 150 I = 1,NPB1                                                 PREP 960
      R(I,1) = 0.0                                                      PREP 970
      R(I,2) = 1.0                                                      PREP 980
  150 R(I,3) = COSSQR(I)                                                PREP 990
      NBEGIN = NPB1 + 1                                                 PREP1000
      NEND = NPB1 + NPB2                                                PREP1010
      DO 160 I = NBEGIN,NEND                                            PREP1020
      R(I,1) = 1.0                                                      PREP1030
      R(I,2) = 0.0                                                      PREP1040
  160 R(I,3) = 0.0                                                      PREP1050
  170 REWIND 4                                                          PREP1060
      ASSIGN 190 TO M                                                   PREP1070
      IF (FLG32.NE.0) ASSIGN 180 TO M                                   PREP1080
      DO 220 I = 1, NT                                                  PREP1090
      GO TO M, ( 180 , 190 )                                            PREP1100
  180 READ (9) (A(J),J=1,NT),(A(J),J=1,NT),(A(J),J=1,NT)                PREP1110
```

```
      GO TO 200                                                         PREP1120
  190 READ (9) (A(J),J=1,NT)                                            PREP1130
  200 DO 210 J = 1, NSIGA                                               PREP1140
      K = NT+J                                                          PREP1150
  210 A(K)=  R(I,J)                                                     PREP1160
  220 WRITE (3) (A(J),J=1,L)                                            PREP1170
C  AXISYMMETRIC FLOW            INPUT TO SOLVIT ON TAPE 3               PREP1180
C                               OUTPUT FROM SOLVIT ON TAPE 3            PREP1190
C  TAPES 1 AND 2 ARE SCRATCH TAPES                                      PREP1200
      CALL SOLVIT(WKAREA,NT,NSIGA,16000,3,14,2,3)
      REWIND 9                                                          PREP1220
C **              * PREPARE CROSSFLOW MATRIX TAPE (11)                  PREP1230
C **              * SKIP SINA * READ COSA                               PREP1240
  230 IF (FLG04.EQ.0) GO TO 400                                         PREP1250
      K = 0                                                             PREP1260
      L = NT+NSIGC                                                      PREP1270
      IF (FLG22.GT.0) GO TO 300                                         PREP1280
      READ (4) (A(I),I=1,NT),(A(I),I=1,NT)                              PREP1290
      IF (FLG17.NE.0) GO TO 250                                         PREP1300
      K = K+1                                                           PREP1310
      DO 240 I = 1, NT                                                  PREP1320
  240 R(I,K) = A(I)                                                     PREP1330
  250 IF (NNU) 290 , 290 , 260                                          PREP1340
  260 DO 280 J = 1, NNU                                                 PREP1350
      READ (4) MS,(A(I),I=1,NT)                                         PREP1360
      IF ( MS.EQ.0.OR.MS.EQ.2.OR.MS.EQ.4) GO TO 280                     PREP1370
      K = K+1                                                           PREP1380
      DO 270 I = 1, NT                                                  PREP1390
  270 R(I,K) = -A(I)                                                    PREP1400
  280 CONTINUE                                                          PREP1410
  290 REWIND 4                                                          PREP1420
      GO TO 330                                                         PREP1430
C***   ***CROSS FLOW   *   GENERATED (RESEP) BOUNDARY CONDITIONS        PREP1440
  300 DO 310 I = 1,NPB1                                                 PREP1450
  310 R(I,1) = -RHS(I)                                                  PREP1460
      DO 320 I = NBEGIN,NEND                                            PREP1470
  320 R(I,1) = 0.0                                                      PREP1480
  330 ASSIGN 360  TO M                                                  PREP1490
      IF (FLG12.NE.0) ASSIGN 340  TO M                                  PREP1500
      DO 390  I = 1, NT                                                 PREP1510
      GO TO M, ( 340 , 360 )                                            PREP1520
  340 READ (10) (A(J),J=1,NT),(A(J),J=1,NT),(A(J),J=1,NT)               PREP1530
C***   ***FORM PHI MATRIX FROM THETA (CROSS FLOW) MATRIX                PREP1540
      DO 350  J = 1,NT                                                  PREP1550
  350 A(J) = Y2(I) * A(J)                                               PREP1560
      GO TO 370                                                         PREP1570
  360 READ (10) (A(J),J=1,NT)                                           PREP1580
  370 DO 380  J = 1, NSIGC                                              PREP1590
      K = NT+J                                                          PREP1600
  380 A(K) =-R(I,J)                                                     PREP1610
  390 WRITE (11) (A(J),J=1,L)                                           PREP1620
C  CROSS FLOW        INPUT TO SOLVIT ON TAPE 11                         PREP1630
C                    OUTPUT FROM SOLVIT ON TAPE 3                       PREP1640
C  TAPES 1 AND 2 ARE SCRATCH TAPES                                      PREP1650
      CALL SOLVIT(WKAREA,NT,NSIGC,16000,11,14,2,3)
      REWIND 10                                                         PREP1670
  400 CONTINUE                                                          PREP1680
```

```
C***     ***EXTRA CROSS FLOW
         REWIND 11
         IF (FLG21.EQ.0 .AND. FLG22.EQ.0) GO TO 790
         K = 0
         L = NT + NSIGEC
         IF (FLG22.GT.0) GO TO 430
C***     ***EXTRA CROSS FLOW    *   NON-UNIFORM FLOW ONLY
C***     ***SKIP RECORD WITH SINES AND COSINES
         READ (4)
         DO 420  J=1,NNU
         READ(4) MS, (A(I),I=1,NT)
         IF (MS.LT.2.OR.MS.EQ.3) GO TO 420
         K = K+ 1
         DO 410  I = 1,NT
     410 R(I,K) = A(I)
     420 CONTINUE
         GO TO 460
C***     ***EXTRA CROSS FLOW    *   GENERATED (RESEP) BOUNDARY CONDITIONS
     430 DO 440  I = 1,NPBI
     440 R(I,1) = COSSCR(I)
         DO 450  I = NBEGIN,NEND
     450 R(I,1) = 0.0
     460 REWIND 4
C***     ***M IS 1920   *   SOLVE A MATRIX
         ASSIGN 470  TO M
C***     ***M IS 1940   *   SOLVE POTENTIAL MATRIX
         IF (FLG12.NE.0)ASSIGN 480  TO M
         DO 520  I = 1,NT
         GO TO M, ( 470 , 480 )
C***     ***SOLVE A MATRIX
     470 READ (8) (A(J),J =1,NT)
         GO TO 500
     480 READ (8) (A(J),J=1,NT),(A(J),J=1,NT),(A(J),J=1,NT)
C***     ***FORM PHI MATRIX FROM THETA (EXTRA CROSS FLOW) MATRIX
         DO 490  J = 1,NT
     490 A(J) = Y2(I) * A(J) / 2.0
     500 DO 510  J = 1,NSIGEC
         K = NT + J
     510 A(K) = R(I,J)
     520 WRITE (11) (A(J),J=1,L)
C***     ***EXTRA CROSS FLOW   INPUT TO SOLVIT ON TAPE 11
C***     ***OUTPUT FROM SOLVIT ON TAPE 3
C***     ***TAPES 1 AND 2 ARE SCRATCH TAPES
         CALL SOLVIT (WKAREA,NT,NSIGEC,1600C,11,14,2,3)
         REWIND 8
         REWIND 11
         GO TO 790
     530 IF(FLG23 .GT. 0)GO TO 570
         NR = NT - NMA
         L = NMA+1
         READ (4) (R(I,1),I=1,NMA)
         READ (4) (FF(I),I=1,NR)
         DO 540  I = 1, NR
     540 FF(I) = FF(I)/FOURPI
         BACKSPACE 4
         WRITE (4) (FF(I),I=1,NR)
         REWIND 4
```

```
      DO 560  I = 1, NMA
      READ (9) (A(J),J=1,NMA),(T(J),J=1,NR)
      DO 550  J = 1, NR
  550 R(I,1) = R(I,1)- T(J)*FF(J)
      A(L) =  R(I,1)
  560 WRITE (3) (A(J),J=1,L)
C  PRESCRIBED VORTICITY      INPUT FOR SOLVIT ON TAPE 3
C                            OUTPUT FROM SOLVIT ON TAPE 3
C  TAPES 1 AND 2 ARE SCRATCH TAPES
      CALL SOLVIT(WKAREA,NMA,L - NMA,16000,3,14,2,3)
      REWIND 9
      GO TO 230
  570 NR = NT - NMA
      NMAP1 = NMA + 1
C*** *  CALCULATE THE NUMBER OF RHS
C
      LL = 0
      DO 580  I=1,NB
      IF( NLF(I) .GT. 0 )GO TO 580
      LL = LL + 2
  580 CONTINUE
      L = NMAP1 + LL
C
C*** *  READ SINS FOR STREAMFLOW RHS
C
      READ(4)( R(I,1),I=1,NMA )
C
C*** *  READ  INPUT PRESCRIBED VORTICITIES
C
      READ(4)( FF(I),I=NMAP1,NT )
      WRITE(6, 590 ) (FF(I),I=NMAP1,NT)
  590 FORMAT(1H1,' THE INPUT PV ARE '/(6E20.7))
      DO 600  I = NMAP1,NT
  600 FF(I) = FF(I) / (-FOURPI)
C
C*** *  READ STRIP VORTEX RHS
C
      LLD2P1 = LL/2 + 1
      DO 610  J=2,LLD2P1
  610 READ(4)MS,( R(I,J),I=1,NMA )
C
C*** *  IPV IS BODY NUMBER OF 1ST PRESCRIBED VORTICITY BODY
C
      IPV = NB - FLG14 + 1
      JBOD = LLD2P1
      NN = NMA
C
      DO 620  KCNT = IPV,NB
      JBOD = JBOD + 1
      NN = NN + ND(KCNT) - 1
C
C*** *  READ COLUMN OF RHS CALCULATED BY NOTS FORMULA
C
      READ(4) (R(ICNT,JBOD),ICNT = 1,NMA)
C
C*** *  MULTIPLY NOTS COLUMN BY LAST PRESCRIBED VORTICITY ON THAT BODY
C
```

```
      DO 620  ICNT =1,NMA                                              PREP2830
  620 R(ICNT,JBOD) = R(ICNT,JBOD) + FF(NN) *(-FOURPI)                  PREP2840
C                                                                      PREP2850
      REWIND 4                                                         PREP2860
      DO 650  I=1,NMA                                                  PREP2870
      NEND = NMA                                                       PREP2880
      JBOD = LL02P1                                                    PREP2890
      READ(9) ( A(J),J=1,NMA),( T(J),J=NMAP1,NT )                      PREP2900
C                                                                      PREP2910
      DO 630  KCNT=IPV,NB                                              PREP2920
      JBOD = JBOD + 1                                                  PREP2930
      NBEG = NEND + 1                                                  PREP2940
      NEND = NEND + ND(KCNT) -1                                        PREP2950
C                                                                      PREP2960
C*** *  SUM PV VORTEX ELEMENTS * INPUT PV AND ADD TO NOTS RHS           PREP2970
C                                                                      PREP2980
      DO 630  NCNT=NBEG,NEND                                           PREP2990
C                                                                      PREP3000
C     ***   WHEN COMING OFF UNIT 9, THE VORTEX ELEMENTS( T(J) ) ARE STILL PREP3010
C     ***   WHILE NOTS COLUMNS COMING OFF UNIT 4 ARE RHS.   THE TWO SHOULDPREP3020
C     ***   ADDED TO FORM A COMPLETE RHS, BUT THEY ARE SUBTRACTED SINCE THPREP3030
C     ***   OF T(J)  MUST BE CHANGED                                   PREP3040
C                                                                      PREP3050
  630 R(I,JBOD) = R(I,JBOD) - T(NCNT) * FF(NCNT)                       PREP3060
C                                                                      PREP3070
C*** *  ATTACH ALL RHS FOR ROW NUMBER I                                 PREP3080
C                                                                      PREP3090
      LRHS = 0                                                         PREP3100
      DO 640   ICNT=NMAP1,L                                            PREP3110
      LRHS = LRHS + 1                                                  PREP3120
  640 A(ICNT) = R(I,LRHS)                                              PREP3130
C                                                                      PREP3140
  650 WRITE(3)(A(J),J=1,L)                                             PREP3150
C*** *  RING WING OPTION       INPUT FOR SOLVIT ON TAPE 3               PREP3160
C*** *                         OUTPUT FOR SOLVIT ON TAPE 3              PREP3170
C                                                                      PREP3180
      CALL SOLVIT(WKAREA,NMA,L-NMA,16000,3,1,2,3)                      PREP3190
      REWIND 9                                                         PREP3200
      GO TO 230                                                        PREP3210
  660 WRITE(6, 670 )                                                   PREP3220
  670 FORMAT(61H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR PRESCRIBED VORTPREP3230
     1ICITY)                                                           PREP3240
      GO TO 780                                                        PREP3250
  680 WRITE(6, 690 )                                                   PREP3260
  690 FORMAT(71H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR PRESCRIBED TANGPREP3270
     1ENTIAL VELOCITY)                                                 PREP3280
      GO TO 780                                                        PREP3290
  700 WRITE (6, 710 )                                                  PREP3300
  710 FORMAT(58H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR AXISYMMETRIC FLPREP3310
     1OW)                                                              PREP3320
      GO TO 780                                                        PREP3330
  720 WRITE(6, 730 )                                                   PREP3340
  730 FORMAT(51H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR CROSS FLOW)    PREP3350
      GO TO 780                                                        PREP3360
  740 WRITE (6, 750 )                                                  PREP3370
  750 FORMAT (57H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR EXTRA CROSS FLPREP3380
     1OW)                                                              PREP3390
```

```
      GO TO 780                                                 PREP3400
  760 WRITE(6, 770 )                                            PREP3410
  770 FORMAT(51H NOT ENOUGH SPACE RESERVED IN SOLVIT FOR RING WING ) PREP3420
  780 STOP                                                      PREP3430
  790 RETURN                                                           I
  790 CONTINUE                                                         C
      END                                                       PREP3440
```

```
      SUBROUTINE PUNCHC(R,J,LOC,CASE)
      DIMENSION R(400)                                                  PNCH 110
      CALL PUNCH 3 ( R, J, LOC, NSEQ, 0, CASE, PROG)                    PNCH 120
      NSEQ = NSEQ + 1
      RETURN
      END
```

```
SO.PCHV                                                    25 AUG 75  18
      SUBROUTINE PUNCHV (AP, J, L, LOC, CASE)                   PNCH  20
C                                                               PNCH  10
      DIMENSION     AP(500,5),T(500)                            PNCH  40
      DATA PROG / 4HEDOA /, NSEQ / 1 /                          PNCH  30
      DO 20 I = 1, L                                            PNCH  50
      DO 10 K = 1, J                                            PNCH  60
   10 T(K) = AP(K, I)                                           PNCH  70
   20 CALL PUNCH 3 (T, J, LOC, NSEQ, 0, CASE, PROG)             PNCH  80
   30 NSEQ = NSEQ + 1                                           PNCH 130
      RETURN                                                    PNCH 140
      END                                                       PNCH 150
```

```
      SUBROUTINE PUNCH 3 ( VALUE, N, LOC, NSEQ, K1264, KASE, PROG)     PNH3  20
C                                                                      PNH3  10
      DOUBLE PRECISION A, B, C, D, FMT                                 PNH3  30
      DOUBLE PRECISION CMT                                             PNH3  40
      DIMENSION VALUE(1), A(11), B(4), FMT(15), V(4), C(7)             PNH3  50
      DIMENSION CMT(16)                                                PNH3  60
      DATA CMT(1)/5H1H  , /,A(1)/6HF12.9,/,A(2)/6HF12.8,/,A(3)/6HF12.7,/,
     1 A(4)/6HF12.6,/,A(5)/6HF12.5,/,A(6)/6HF12.4,/,A(7)/6HF12.3,/,
     2 A(8)/6HF12.2,/,A(9)/6HF12.1,/,A(10)/6HF12.0,/,A(11)/6H6X,A6,/,
     3 B(1)/3HI1,/,B(2)/3HI2,/,B(3)/3HI3,/,B(4)/3HI4,/,C(1)/6H3HOOO,/,
     5 C(2)/5H2HOO,/,C(3)/4H1HO,/,C(4)/1H,/,C(5)/3H1X,/,C(6)/4H1H+,/,
     6 C(7)/4H12X,/,D/5HERROR/,FMT(1)/1H(/,FMT(8)/4H11X,/,FMT(10)/3H1X,/
     7 ,FMT(11)/6HA6,1X,/,FMT(12)/3HA4,/,FMT(15)/1H)/
C     FUNCTION STATEMENT TO SIZE 'LOC' AND 'NSEQ'                      PNH3 170
      ISIZE(IK) = MOD(IABS(IK), 10000)                                 PNH3 180
      NSEQ = ISIZE(NSEQ)                                               PNH3 190
      LOC = ISIZE(LOC)                                                 PNH3 200
C     START FORMING THE FORMAT.                                        PNH3 210
      FMT(9) = C(5)                                                    PNH3 220
      K = 1                                                            PNH3 230
      M = N                                                            PNH3 240
      NF = 4                                                           PNH3 250
C     START OF LOOP                                                    PNH3 260
   10 IF ( M - 4 ) 20 , 40 , 40                                        PNH3 270
   20 IF ( M .LE. 0 ) RETURN                                           PNH3 280
      FMT(9) = C(K1264+5)                                              PNH3 290
      NT = M + 1                                                       PNH3 300
C     IF THE ENTIRE CARD IS NOT USED, THIS WILL SET UP THE BLANK FIELDS.PNH3 310
      DO 30 I = NT, 4                                                  PNH3 320
   30 FMT(I+1) = C(7)                                                  PNH3 330
      NF = M                                                           PNH3 340
C     DETERMINE THE SIZE OF THE NUMBERS.                               PNH3 350
   40 DO 80 NT = 1, NF                                                 PNH3 360
      V(NT) = ABS(VALUE(K)) + 5.0E-10                                  PNH3 370
      DO 50 I = 1, 10                                                  PNH3 380
      V(NT) = V(NT) / 10.0                                             PNH3 390
      IF ( V(NT) .LT. 1.0 ) GO TO 60                                   PNH3 400
   50 CONTINUE
C     IF CONTROL REACHES THIS POINT, THE NUMBER EXCEEDED 1CE10.        PNH3 410
      V(NT) = D                                                        PNH3 420
      I = 11                                                           PNH3 430
      GO TO 70                                                         PNH3 440
   60 V(NT) = VALUE(K)                                                 PNH3 450
   70 K = K + 1                                                        PNH3 460
   80 FMT(NT+1) = A(I)                                                 PNH3 470
C     DETERMINE THE SIZE OF 'LOC'.                                     PNH3 480
   90 L = LOC                                                          PNH3 490
      DO 100 I = 1, 4                                                  PNH3 500
      L = L / 10                                                       PNH3 510
      IF ( L .EQ. 0 ) GO TO 110                                        PNH3 520
  100 CONTINUE
C     IF CONTROL REACHES THIS POINT, 'LOC' EXCEEDED 10000.             PNH3 530
      LOC = ISIZE(LOC)                                                 PNH3 540
      GO TO 90                                                         PNH3 550
C     SET UP THE LOCATION FIELD.                                       PNH3 560
  110 FMT(6) = C(I)                                                    PNH3 570
```

```
      FMT(7) = B(I)                                                     PNH3 580
C     DETERMINE THE SIZE OF 'NSEQ'.                                     PNH3 590
  120 L = NSEQ                                                          PNH3 600
      DO 130 I = 1, 4                                                   PNH3 610
      L = L / 10                                                        PNH3 620
      IF ( L .EQ. 0 ) GO TO 140                                         PNH3 630
  130 CONTINUE
C     IF CONTROL REACHES THIS POINT, 'NSEQ' EXCEEDED 10000.             PNH3 640
      NSEQ = ISIZE(NSEQ)                                                PNH3 650
      GO TO 120                                                         PNH3 660
C     SET UP THE SEQUENCE FIELD.                                        PNH3 670
  140 FMT(13) = C(I)                                                    PNH3 680
      FMT(14) = B(I)                                                    PNH3 690
C     WRITE THG CARD IMAGE.                                             PNH3 700
  200 FORMAT(4E13.8)
      WRITE (7,200)          ( V(I), I=1,NF )                           PNH3 710
C**    ***CHANGE VARIABLE FORMAT FOR PRINTER SO THAT THE CARRIAGE CONTROPNH3 720
C***   ***CHARACTER IS A BLANK                                          PNH3 730
      DO 150 ICMT = 2,16                                                PNH3 740
  150 CMT(ICMT) = FMT( ICMT - 1 )                                       PNH3 750
      WRITE(6,300) ( V(I),I=1,NF)
  300 FORMAT(1H ,4E13.8)
      NSEQ = NSEQ + 1                                                   PNH3 780
      LOC = LOC + 4                                                     PNH3 790
      M = M - 4                                                         PNH3 800
      GO TO 10                                                          PNH3 810
      END                                                               PNH3 820
```

```
SO.QCC                                                                    25 AUG 75   18
      SUBROUTINE QC(OMEG,QM,Q)                                                QC   20
C                                                                             QC   10
C THIS SUBROUTINE CALCULATES THE LEGENDRE FUNCTIONS OF THE SECOND KIND         QC   30
C AND HALF ORDER. THE ARGUMENTS ARE*                                          QC   40
C        OMEG   ARGUMENT FOR WHICH LEGENDRE FUNCTIONS WILL BE FOUND           QC   50
C        QM     VALUE OF LEGENDRE FUNCTION OF MINUS ONE HALF ORDER            QC   60
C        Q      VALUE OF LEGENDRE FUNCTION OF PLUS ONE HALF ORDER             QC   70
      DOUBLE PRECISION OMEGD,ARG,A,F,E,QMD,QD                                 QC   80
      OMEGD=OMEG                                                              QC   90
      ARG=2.D/(OMEGD+1.D)                                                     QC  100
      A=1.D-ARG                                                               QC  110
      CALL ELLC (A,F,E,1)                                                     QC  120
      CALL ELLC (A,F,E,2)                                                     QC  130
      QMD=F*ARG**0.5                                                          QC  140
      QD=-E*(2.D*(OMEGD+1.D))**0.5+OMEGD*QMD                                  QC  150
      QM=QMD                                                                  QC  160
      Q=QD                                                                    QC  170
      RETURN                                                                  QC  180
      END                                                                     QC  190
```

```
      SUBROUTINE RAKFLO(VX,VY,NSIG)
C
C THIS ROUTINE INTEGRATES THE MASS FLOW THROUGH EACH OF THE 'AUTOMATIC'
C RAKES.
C
      COMMON /BLOCKR/ NRAKES,RNAME(20,9),RAKEA(20),RUNITX(20),
     1 RUNITY(20),RDS(20),NRPTS(20),COSTH(20),IRAKE,NOFF,X1R(20),
     2 Y1R(20),X2R(20),Y2R(20)
      DIMENSION VX(500,5),VY(500,5),F(201),UX(201),UY(201)
      REAL NX,NY,MDOT
      DATA TWOPI/6.2831854/
      WRITE (6, 50 )
      DO 40   ISIG=1,NSIG
      J = NOFF
C LOOP FOR EACH RAKE ...
      DO 30   IRAKE=1,NRAKES
C SETUP THE VELOCITY VECTORS FOR THIS RAKE ...
      MP1 = NRPTS(IRAKE) + 1
      DO 10 I=2,MP1
      J = J + 1
      UX(I) = VX(J,ISIG)
   10 UY(I) = VY(J,ISIG)
C
C USE LINEAR EXTRAPOLATION TO CALCULATE THE VELOCITY AT BOTH ENDS OF THE
C RAKE (I.E. AT THE BEGINNING OF THE FIRST INTERVAL AND AT THE END OF
C THE LAST INTERVAL) ...
      UX(1) = UX(2) + (UX(2) - UX(3))
      UY(1) = UY(2) + (UY(2) - UY(3))
      NPTS = NRPTS(IRAKE) + 2
      UX(NPTS) = UX(NPTS-1) + (UX(NPTS-1) - UX(NPTS-2))
      UY(NPTS) = UY(NPTS-1) + (UY(NPTS-1) - UY(NPTS-2))
C
C NOW SETUP THE FUNCTION (V DOT N)*(DA) ...
      NX = RUNITX(IRAKE)
      NY = RUNITY(IRAKE)
      DS = RDS(IRAKE)
      Y1 = Y1R(IRAKE)
      COS = COSTH(IRAKE)
      S = 0.0
      DO 20 I=1,NPTS
      F(I) = TWOPI*((UX(I)*NX + UY(I)*NY)*(Y1 + S*COS))
   20 S = S + DS
C
C PERFORM SIMPSON RULE INTEGRATION ...
      CALL SIMSON(F,NPTS,DS,MDOT)
C
      VAVG = MDOT / RAKEA(IRAKE)
      WRITE (6, 60 ) ISIG,IRAKE,X1R(IRAKE),Y1R(IRAKE),X2R(IRAKE),Y2R(IRA
     1KE),(RNAME(IRAKE,I),I=1,9),RAKEA(IRAKE),VAVG,MDOT
   30 CONTINUE
C
   40 WRITE (6, 70 )
C
      RETURN
C
C
```

```
      50 FORMAT(1H1,38X,'A U T O M A T I C   R A K E   C A L C U L A T I O RKFL 570
        1N S',//1H0,101X,'TOTAL',4X,'AVERAGE',6X,'TOTAL',/' AXI.FLOW  RAKE'RKFL 580
        2,88X,'FLUX',6X,'FLUX',6X,'VOLUME',/'  NUMBER     NO.',6X,'X1',9X, RKFL 590
        3'Y1',9X,'X2',9X,'Y2',6X,'****** INPUT IDENTIFICATION *******',6X, RKFL 600
        4'AREA     VELOCITY   FLUX RATE',/1H )                             RKFL 610
      60 FORMAT(3X,I3,I8,2X,4F11.5,2X,8A4,A3,F12.4,F11.6,F11.5)            RKFL 620
      70 FORMAT(1H0)                                                       RKFL 630
         END                                                               RKFL 640
```

```
SO.SIMSO                                                    25 AUG 75   18
      SUBROUTINE SIMSON(Y,N,DX,AREA)
C
C
C THIS ROUTINE INTEGRATES Y OVER (N-1) INTERVALS OF EQUAL LENGTH, DX,
C YIELDING THE ENCLOSED AREA. (N MUST BE AN ODD INTEGER.)
C
      DIMENSION Y(1)
C
      SUM = Y(1) + 4.0*Y(N-1) + Y(N)
      IF (N .EQ. 3) GO TO 20
      NM2 = N - 2
      DO 10 I=2,NM2,2
   10 SUM = SUM + 4.0*Y(I) + 2.0*Y(I+1)
C
   20 AREA = (ABS(DX)/3.0) * SUM
      RETURN
      END
```

```
      SUBROUTINE SOLCOM( DV,  A   , ICNT)
C
C
C **   NOTE THAT THIS SUBROUTINE SOLVES ONLY A 1X1 OR 2X2 MATRIX
C **   IT IS SEPARATED SO THAT IF PROGRAM IS EVER INLARGED, THIS
C **   IS WHERE THE MATRIX SOLUTION FOR THE COMBINATION PART OF
C **   THE PROGRAM WILL GO.  THE MATRICES HAVE BEEN FORMED GENERALLY
C **   IN SUBROUTINE COMBO.
C
      DIMENSION DV(2), A(2,2)
      IF(ICNT .EQ. 2) GO TO 10
      DV(1) = DV(1) / A(1,1)
      RETURN
   10 DV(1) = (DV(1) - (A(1,2)/A(2,2) ) * DV(2)  ) /
     1        (  A(1,1)  -  A(1,2)*A(2,1) / A(2,2)  )
      DV(2) =( DV(2) - A(2,1)*DV(1) ) / A(2,2)
      RETURN
      END
```

```
      SUBROUTINE  SOLVIT (A, ND, MD, KD, NI, MM, NO, NW)
C
C
C
C              ****    ***/  *******  *****  *        ***/        *
C              *   *   *  /*    *     *      *        *  /*     ******
C     ****     ****    * / *    *     ***    *        * / *  ****  *  *
C              *       */  *    *     *      *        */  *       ***
C              *       /***     *     *      *****    /***       *  *
C
C                D I R E C T   M A T R I X   S O L U T I O N
C
C     WRITTEN BY J. L. HESS * PROGRAMMED BY T. M. RIDDELL
C
      DIMENSION  A ( KD )
C
      LOGICAL  LAST
C
      CALL TIMEV(AA1)
      N = ND
      M = MD
      KORE = KD
      NPM = N + M
      IF (MAXO(3 * NPM, M * N) .GT. KORE) GO TO 300
      MT = MM
      REWIND MT
      NIN = NI
      REWIND NIN
      NOUT = NO
      REWIND NOUT
      MP1 = M + 1
      NN = N
      NEL = NPM
C
C - - CALCULATE THE MAXIMUM NO. OF ROWS, 'K'
C
   10 K = (KORE - NEL) / NEL
C
C - - TEST TO SEE IF THE REST OF THE MATRIX WILL FIT IN CORE
C
      LAST = K .GE. NN
      IF (LAST) K = NN
C
C - - READ 'K' ROWS OF THE AUGMENTED 'A' MATRIX
C
      NT = 0
      DO 20 IB = 1, K
      NS = NT + 1
      NT = NT + NEL
   20 READ (NIN) (A(ID), ID = NS, NT)
C
C - - CHECK TO SEE IF WE WERE UNLUCKY ENOUGH TO END UP WITH ONLY ONE ROW
C
      IF (K .EQ. 1) GO TO 80
C
C - - 'K' IS GREATER THAN '1' SO WE CAN START THE TRIANGULARIZATION
```

```
C
      NELP1 = NEL + 1
      NS = - NEL
      NELP2 = NELP1 + 1
C
C - - FORM THE 'TRAPEZOIDAL' ARRAY  (8)
C
      DO 30 IB = 2, K
      NP = NELP2 - IB
      NS = NS + NELP1
      NT = NS
      DO 30 IO = IB, K
      NT = NT + NEL
      MN = NT
      NB = NS
      A(NT) = (-A(NT)) / A(NS)
      DO 30 NF = 2, NP
      MN = MN + 1
      NB = NB + 1
   30 A(MN) = A(MN) + A(NT) * A(NB)
      IF (LAST) GO TO 80
C
C - - WRITE THE 'TRAPEZOIDAL' MATRIX ON TAPE
C
      NT = 0
      NP = NEL
      NS = - NEL
      DO 40 IO = 1, K
      NS = NS + NELP1
      NT = NT + NEL
      WRITE (MT) NP, (A(IB), IB = NS, NT)
   40 NP = NP - 1
      NP = NP - M
      NS = KORE - NEL + 1
C
C - - READ ANOTHER ROW
C
      DO 70 IO = 1, NP
      READ (NIN) (A(IB), IB = NS, KORE)
C
C - - MODIFY THIS ROW BY THE 'TRAPEZOIDAL' ARRAY
C
      NT = 1
      MN = NS
      DO 60 IB = 1, K
      NB = NT
      NF = MN + 1
      A(MN) = (-A(MN)) / A(NT)
      DO 50 NN = NF, KORE
      NB = NB + 1
   50 A(NN) = A(NN) + A(MN) * A(NB)
      MN = NF
   60 NT = NT + NELP1
C
C - - WRITE THE MODIFIED ROW ON TAPE
C
   70 WRITE (NOUT)      (A(NT), NT = MN, KORE)
```

```
      REWIND NOUT                                                       SLVT1140
      REWIND NIN                                                        SLVT1150
C                                                                       SLVT1160
C - - SWITCH THE TAPES                                                  SLVT1170
C                                                                       SLVT1180
      NT = NIN                                                          SLVT1190
      NIN = NOUT                                                        SLVT1200
      NOUT = NT                                                         SLVT1210
C                                                                       SLVT1220
C - - RE-CALCULATE ROW LENGTH AND LOOP BACK                              SLVT1230
C                                                                       SLVT1240
      NEL = NEL - K                                                     SLVT1250
      NN = NEL - M                                                      SLVT1260
      GO TO 10                                                          SLVT1270
C                                                                       SLVT1280
C - - REWIND ALL TAPES                                                   SLVT1290
C                                                                       SLVT1300
   80 REWIND MT                                                         SLVT1310
      REWIND NIN                                                        SLVT1320
      REWIND NOUT                                                       SLVT1330
C                                                                       SLVT1340
C - - CONDENSE THE MATRIX                                                SLVT1350
C                                                                       SLVT1360
      NN = NEL                                                          SLVT1370
      NL = NEL + 1                                                      SLVT1380
      IF (K .EQ. 1) GO TO 100                                           SLVT1390
      NS = 1                                                            SLVT1400
      NT = NEL                                                          SLVT1410
      DO 90  IB = 2, K                                                  SLVT1420
      NS = NS + NELP1                                                   SLVT1430
      NT = NT + NEL                                                     SLVT1440
      DO 90  IO = NS, NT                                                SLVT1450
      A(NL) = A(IO)                                                     SLVT1460
   90 NL = NL + 1                                                       SLVT1470
  100 N1 = KORE - K * M + 1                                             SLVT1480
C                                                                       SLVT1490
C - - THERE, NOW WE CAN START THE BACK-SOLUTION                          SLVT1500
C * * NOTE..THE FIRST AVAILABLE LOCATION FOR THE SOLUTIONS IS A(N1)     SLVT1510
C                                                                       SLVT1520
      NREM = N                                                          SLVT1530
      NEL = NPM                                                         SLVT1540
      LAST = K .EQ. N                                                   SLVT1550
      NPASS = 0                                                         SLVT1560
C                                                                       SLVT1570
C - - SOLVE FOR THE ANSWERS CORRESPONDING TO 'K' ROWS                    SLVT1580
C                                                                       SLVT1590
  110 KM1 = K - 1                                                       SLVT1600
      KP1 = K + 1                                                       SLVT1610
      NS = NL - MP1                                                     SLVT1620
      NPASS = NPASS + 1                                                 SLVT1630
      DO 140 MN = 1, M                                                  SLVT1640
      NF = NS + MN                                                      SLVT1650
      A(NF) = A(NF) / A(NS)                                             SLVT1660
      NT = NS                                                           SLVT1670
      IF (KM1 .EQ. 0) GO  TO 140                                        SLVT1680
      DO 130 IB = 1, KM1                                                SLVT1690
      NF = NF - IB - M                                                  SLVT1700
```

```
      NT = NT - MP1 - IB
      SUM = 0.0
      NP = NF
      N2 = MP1 + IB
      DO 120 IO = 1, IB
      NN = NT + IO
      NP = NP + N2 - IO
  120 SUM = SUM + A(NN) * A(NP)
  130 A(NF) = (A(NF) - SUM) / A(NT)
  140 CONTINUE
C
C - - MOVE THE SOLUTIONS TO CONTIGUOUS LOCATIONS STARTING AT A(NI)
C
      NI = MORE + 1
      DO 160 MN = 1, K
      DO 150 MN = 1, M
      NL = NL - 1
      NI = NI - 1
  150 A(NI) = A(NL)
  160 NL = NL - NN
C
C - - WRITE THE SOLUTIONS ON TAPE
C
      WRITE (NIN) K
      NS = NI - 1
      DO 170 MN = 1, M
      NT = NS + MN
  170 WRITE ( NIN ) (A(IO), IO = NT, MORE, M)
C
C - - TEST IF THIS IS THE LAST MASS
C
      IF (LAST) GO TO 250
C
C - - WE MUST NOW MODIFY THE TRIANGULAR MATRIX TO REFLECT THE EFFECT OF
C     THE SOLUTIONS OBTAINED SO FAR  (EQ 21)
C * * NOTE..LOCATIONS A(1) TO A(NI-1) ARE NOW FREE TO USE
C
C - - CALCULATE THE NEXT VALUES OF 'NEL' AND 'NREM'
C
      NELOLD = NEL
      KOLD = K
      NEL = NEL - K
      NREM = NREM - K
C
C - - NOW APPLY THE INCREDIBLE FORMULA FOR THE NEW 'K'
C
      K = (-4 * M - 1) / 2 + IFIX(SQRT(0.25 + FLOAT((4 * M + 2) * M +
     1 2 * (MORE - NELOLD))))
      NROW = NREM - K + 1
      IF (K .LT. NREM) GO TO 180
      LAST = .TRUE.
      NROW = 1
      K = NREM
  180 NS = 1
      NT = NELOLD + 1
C
C - - READ IN THE ROWS TO BE MODIFIED
```

```
      C                                                                 SLVT2280
            DO 240 IB = 1, NRFM                                         SLVT2290
            NT = NT - 1                                                 SLVT2300
            IF (IB .LE. NROW) GO TO 190                                 SLVT2310
            NS = NS + NN                                                SLVT2320
            NT = NT + NN                                                SLVT2330
        190 READ ( MT ) NN, (A(IO), IO = NS, NT)                        SLVT2340
            NP = NT - 1                                                 SLVT2350
            NF = NT - M - KM1                                           SLVT2360
            MN = NN - KOLD                                              SLVT2370
            DO 210 MN = 1, M                                            SLVT2380
            N2 = NF                                                     SLVT2390
            NA = NP + MN                                                SLVT2400
            NB = NA                                                     SLVT2410
            SUM = 0.0                                                   SLVT2420
            DO 200 IO = 1, KOLD                                         SLVT2430
            SUM = SUM + A(N2) * A(NA)                                   SLVT2440
            N2 = N2 + 1                                                 SLVT2450
        200 NA = NA + M                                                 SLVT2460
            N2 = N2 + MN - 1                                            SLVT2470
        210 A(N2) = A(N2) - SUM                                         SLVT2480
      C                                                                 SLVT2490
      C - - WRITE THE MODIFIED ROW ON TAPE OR CONDENSE THE ROW           SLVT2500
      C                                                                 SLVT2510
            NL = NT - M + 1                                             SLVT2520
            IF (IB .GE. NROW) GO TO 220                                 SLVT2530
            NF = NL - KP1                                               SLVT2540
            WRITE (NOUT) NN, (A(IO), IO = NS, NF), (A(IO), IO = NL, NT) SLVT2550
            GO TO 240                                                   SLVT2560
        220 NF = NL - KOLD                                              SLVT2570
            DO 230 MN = NL, NT                                          SLVT2580
            A(NF) = A(MN)                                               SLVT2590
        230 NF = NF + 1                                                 SLVT2600
        240 CONTINUE                                                    SLVT2610
            REWIND MT                                                   SLVT2620
            REWIND NOUT                                                 SLVT2630
      C                                                                 SLVT2640
      C - - SWITCH THE TAPES                                             SLVT2650
      C                                                                 SLVT2660
            NT = MT                                                     SLVT2670
            MT = NOUT                                                   SLVT2680
            NOUT = NT                                                   SLVT2690
      C                                                                 SLVT2700
      C - - LOOP BACK THRU THE SOLUTION                                  SLVT2710
      C                                                                 SLVT2720
            NL = NF                                                     SLVT2730
            GO TO 110                                                   SLVT2740
      C                                                                 SLVT2750
      C - - START TO WRAP IT UP                                          SLVT2760
      C                                                                 SLVT2770
        250 REWIND NIN                                                  SLVT2780
            N2 = N                                                      SLVT2790
      C                                                                 SLVT2800
      C * * NOTE.. AT THIS POINT ALL LOCATIONS A(1) THRU A(KORE) ARE FREE SLVT2810
      C                                                                 SLVT2820
            DO 270 IB = 1, NPASS                                        SLVT2830
            READ (NIN) K                                                SLVT2840
```

```
      N1 = N2 - K + 1                                                   SLVT2850
      NS = N1                                                           SLVT2860
      NT = N2                                                           SLVT2870
C                                                                       SLVT2880
C - - READ IN THE SOLUTIONS                                             SLVT2890
C                                                                       SLVT2900
      DO 260 IO = 1, M                                                  SLVT2910
      READ (NIN) (A(NN), NN = NS, NT)                                   SLVT2920
      NT = NT + N                                                       SLVT2930
  260 NS = NS + N                                                       SLVT2940
  270 N2 = N1 - 1                                                       SLVT2950
C                                                                       SLVT2960
C ---  REWIND ALL INPUT TAPES                                           SLVT2970
      REWIND NIN                                                        SLVT2980
      REWIND NT                                                         SLVT2990
      REWIN( NOUT                                                       SLVT3000
C - - WRITE THE SOLUTIONS ON TAPE                                       SLVT3010
C                                                                       SLVT3020
      NT = 0                                                            SLVT3030
      DO 280 IO = 1, M                                                  SLVT3040
      NS = NT + 1                                                       SLVT3050
      NT = NT + N                                                       SLVT3060
  280 WRITE (NW) (A(NN), NN = NS, NT)                                   SLVT3070
C                                                                       SLVT3080
      CALL TIMEV(AA2)                                                   SLVT3090
      BB = (AA2 - AA1) / 60.                                            SLVT3100
      WRITE (6, 290 ) N, N, M, BB                                       SLVT3110
  290 FORMAT (4HOTHE I5, 2H X I5, 12H MATRIX WITH I4, 35H RIGHT SIDES WASLVT3120
     1S SOLVED DIRECTLY IN F8.3, 9H MINUTES. )                          SLVT3130
      RETURN                                                            SLVT3140
  300 WRITE (6,310)
  310 FORMAT(34HOSOLVIT.  NOT ENOUGH CORE.  HALT. )
      STOP
      END                                                               SLVT3150
```

```
SO.TIMX                                                    25 AUG 75  18
     1.        SUBROUTINE TIMEV(T)
     2.        T = 0.0
     3.        RETURN
     4.        END
```

```
SO.TSET                                                        25 AUG 75  18
     1.        SUBROUTINE TSETV
     2.        RETURN
     3.        END
```

```
      SUBROUTINE XYZ
C
C
C     OVERLAY (PAN,1,1)
C     PROGRAM XYZ
C
C                 * CONTROL FOR X,Y,Z MATRICES COMPUTATION
C
      COMMON  /D/ D1, D3, XMXJ, YMYJ, XMXJP1, YMYJP1, S
      COMMON        HEDR(10)  ,CASE      ,NB        ,NNU
     1             ,FLG03     ,FLG04     ,FLG05     ,FLG06     ,FLG07
     2             ,FLG08     ,FLG09     ,FLG10     ,FLG11     ,FLG12
     3             ,FLG13     ,FLG14     ,FLG15     ,FLG16     ,FLG17
     4             ,FLG18     ,FLG19     ,FLG20     ,FLG21     ,FLG22
     5             ,FLG23     ,FLG24     ,FLG25     ,FLG26     ,FLG27
      COMMON    NT,         ND(11),    MN,        NUNA(5),   TYPECA(5),
     1          NER1,       NER2,      NMA,       NSIGA,     NSIGC,
     2          NUNC(5),    TYPEC(5),  NLF(11),   IEC,       NSIGEC,
     3          TYPEEC(5),NUNEC(5)
      DOUBLE PRECISION  HEDR, CASE
      INTEGER       FLG03     ,FLG04     ,FLG05     ,FLG06     ,FLG07
     1             ,FLG08     ,FLG09     ,FLG10     ,FLG11     ,FLG12
     2             ,FLG13     ,FLG14     ,FLG15     ,FLG16     ,FLG17
     3             ,FLG18     ,FLG19     ,FLG20     ,FLG21     ,FLG22
     4             ,FLG23     ,FLG24     ,FLG25     ,FLG26     ,FLG27
      REAL          MN
      LOGICAL PF
C
      COMMON  /RNGWNG/ VA(500,2),  VR(500,2),VAN(500), VAT(500)
      COMMON /CL/   X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),
     1              SINA(500),COSA(500),XP(500),  YP(500)
     2             ,XWAKE(11),YWAKE(11)
      COMMON /TL/   A(500),   B(500),   AX(500),  AY(500),  AZ(500),
     1              CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),
     2              VN(500,5),VT(500,5),BON,          IAC,
     3              I,        J,        J1,       SJ,       DS,
     4              DX,       DY,       NI,       XJ,       YJ,
     5              XK,       EEK,      EKK,      K,        PF
C
C                 * START
      IF (BON) 50 , 10 , 50
   10 IF (J-I) 60 , 20 , 60
C                 * J EQUAL I PATH
   20 T1=.5*DELS(J)
      SJ=T1/Y2(J)
      IF (SJ-.08) 30 , 30 , 40
   30 CALL XYZ1
      GO TO 200
   40 SJ=.08
      CALL XYZ1
      NI=33
      T2=.08*Y2(J)
      DS=(T1-T2)/32.
      DX=DS*COSA(J)
      DY=DS*SINA(J)
      XJ=X2(J)+Y2*COSA(J)-DX
```

```
      YJ=Y[illegible])+T2*SINA(J)-DY                                     XYZ  550
      CALL XYZ2                                                          XYZ  560
      GO TO 190                                                          XYZ  570
C                                                                        XYZ  580
C                  * J NOT EQUAL I PATH                                  XYZ  590
C                  * COMPUTE MINIMUM DISTANCE TO I MIDPOINT              XYZ  600
C                                                                        XYZ  610
C OFF-BODY ...                                                           XYZ  620
   50 J1P1 = J1 + 1                                                      XYZ  630
      D1 = (XP(I)-X1(J1))**2 + (YP(I)-Y1(J1))**2                         XYZ  640
      XMID = (X1(J1)+X1(J1P1))/2.0                                       XYZ  650
      YMID = (Y1(J1)+Y1(J1P1))/2.0                                       XYZ  660
      D2 = (XP(I)-XMID)**2 + (YP(I)-YMID)**2                             XYZ  670
      D3 = (XP(I)-X1(J1P1))**2 + (YP(I)-Y1(J1P1))**2                     XYZ  680
      GO TO 70                                                           XYZ  690
C                                                                        XYZ  700
C ON-BODY ...                                                            XYZ  710
   60 J1P1 = J1 + 1                                                      XYZ  720
      XMXJ = X2(I) - X1(J1)                                              XYZ  730
      YMYJ = Y2(I) - Y1(J1)                                              XYZ  740
      XMXJP1 = X2(I) - X1(J1P1)                                          XYZ  750
      YMYJP1 = Y2(I) - Y1(J1P1)                                          XYZ  760
      D1 = XMXJ**2 + YMYJ**2                                             XYZ  770
      D2=(X2(I)-X2(J))**2+(Y2(I)-Y2(J))**2                               XYZ  780
      D3 = XMXJP1**2 + YMYJP1**2                                         XYZ  790
   70 S = SQRT( (X1(J1P1) - X1(J1) )**2  +    ( Y1(J1P1) - Y1(J1) )**2 ) XYZ  800
      IF (D1-D2) 90 , 90 , 80                                            XYZ  810
   80 IF (D2-D3) 110 , 110 , 100                                         XYZ  820
   90 IF (D1-D3) 120 , 120 , 100                                         XYZ  830
  100 DM=SQRT(D3)                                                        XYZ  840
      GO TO 130                                                          XYZ  850
  110 DM=SQRT(D2)                                                        XYZ  860
      GO TO 130                                                          XYZ  870
  120 DM=SQRT(D1)                                                        XYZ  880
C                  * COMPUTE NO. OF INTERVALS(NI) AND DELTA S (DS)       XYZ  890
C                    FOR SIMPSON RULE INTEGRATION                        XYZ  900
  130 IF (DM.EQ.0.0) GO TO 160                                           XYZ  910
      NI=8.*DELS(J)/DM+0.9                                               XYZ  920
      IF (NI) 140 , 140 , 150                                            XYZ  930
  140 NI=3                                                               XYZ  940
      DS=DELS(J)/2.                                                      XYZ  950
      GO TO 180                                                          XYZ  960
  150 NI=NI+NI                                                           XYZ  970
      IF (NI-128) 170 , 160 , 160                                        XYZ  980
  160 NI=129                                                             XYZ  990
      DS=DELS(J)/128.                                                    XYZ 1000
      GO TO 180                                                          XYZ 1010
  170 XNI=NI                                                             XYZ 1020
      DS=DELS(J)/XNI                                                     XYZ 1030
      NI=NI+1                                                            XYZ 1040
  180 DX=DS*COSA(J)                                                      XYZ 1050
      DY=DS*SINA(J)                                                      XYZ 1060
  190 XJ=X1(J1)-DX                                                       XYZ 1070
      YJ=Y1(J1)-DY                                                       XYZ 1080
      CALL XYZ2                                                          XYZ 1090
  200 RETURN                                                             XYZ 1101
C 200 CONTINUE                                                                  C
```

```
114.      END                                                        XYZ 1110
```

```
SO.XYZ2                                                                   25 AUG 75   18
      SUBROUTINE XYZ1                                                     XYZ1  20
C                                                                         XYZ1  10
C                                                                         XYZ1  30
C              * COMPUTE X,Y,Z MATRICES FOR SJ LESS THAN OR EQUAL .08     XYZ1  40
C                                                                         XYZ1  50
      COMMON        HEDR(10)    ,CASE       ,NB         ,NNU              XYZ1  60
     1              ,FLG03      ,FLG04      ,FLG05      ,FLG06    ,FLG07  XYZ1  70
     2              ,FLG08      ,FLG09      ,FLG10      ,FLG11    ,FLG12  XYZ1  80
     3              ,FLG13      ,FLG14      ,FLG15      ,FLG16    ,FLG17  XYZ1  90
     4              ,FLG18      ,FLG19      ,FLG20      ,FLG21    ,FLG22  XYZ1 100
     5              ,FLG23      ,FLG24      ,FLG25      ,FLG26    ,FLG27  XYZ1 110
      COMMON     NT,        ND(11),    MN,        NUNA(5),  TYPEA(5),     XYZ1 120
     1           NER1,      NER2,      NMA,       NSIGA,    NSIGC,        XYZ1 130
     2           NUNC(5),   TYPEC(5),  NLF(11),   IEC,      NSIGEC,       XYZ1 140
     3           TYPEEC(5),NUNEC(5)                                       XYZ1 150
      DOUBLE PRECISION  HEDR, CASE                                        XYZ1 160
      INTEGER       FLG03       ,FLG04      ,FLG05      ,FLG06    ,FLG07  XYZ1 170
     1              ,FLG08      ,FLG09      ,FLG10      ,FLG11    ,FLG12  XYZ1 180
     2              ,FLG13      ,FLG14      ,FLG15      ,FLG16    ,FLG17  XYZ1 190
     3              ,FLG18      ,FLG19      ,FLG20      ,FLG21    ,FLG22  XYZ1 200
     4              ,FLG23      ,FLG24      ,FLG25      ,FLG26    ,FLG27  XYZ1 210
      COMMON  /RNGWNG/ VA(500,2),   VR(500,2),VAN(500), VAT(500)          XYZ1 220
      COMMON /ECF/ ECX(500), ECY(500), ECZ(500)                           XYZ1 230
      REAL          MN                                                    XYZ1 240
      LOGICAL PF                                                          XYZ1 250
C                                                                         XYZ1 260
      COMMON /CL/    X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),   XYZ1 270
     1               SINA(500),COSA(500),XP(500),  YP(500)                XYZ1 280
     2               ,XWAKE(11),YWAKE(11)                                 XYZ1 290
      COMMON /TL/    A(500),   B(500),   AX(500),  AY(500),  AZ(500),     XYZ1 300
     1               CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),     XYZ1 310
     2               VN(500,5),VT(500,5),BON,           IAC,              XYZ1 320
     3               I,        J,        J1,       SJ,       DS,          XYZ1 330
     4               DX,       DY,       NI,       XJ,       YJ,          XYZ1 340
     5               XK,       EEK,      EKK,      K,        PF           XYZ1 350
      COMMON /PRINTF/ PRIN1,PRIN2,PRIN3                                   XYZ1 360
      LOGICAL PRIN1,PRIN2,PRIN3                                           XYZ1 370
C                                                                         XYZ1 380
C              * START                                                    XYZ1 390
C              * INITIALIZE                                               XYZ1 400
      T1=SJ*SJ                                                            XYZ1 410
      T2=ALOG(SJ/8.)                                                      XYZ1 420
      T3=SINA(J)*SINA(J)                                                  XYZ1 430
      T4=T2+T3                                                            XYZ1 440
      T5=.6666667  *T3                                                    XYZ1 450
      T6=T5*T3                                                            XYZ1 460
      T7=SJ*SJ                                                            XYZ1 470
      T8=T7+T7                                                            XYZ1 480
       T9=6.283185 *COSA(J)                                               XYZ1 490
      T10=6.283185 *SINA(J)                                               XYZ1 500
      T11=T1*SJ                                                           XYZ1 510
      T14 = .3333333 * (16.0 + 6.0 * T3) + 2.0 * T2                       XYZ1 520
      IF (IEC.EQ.-1) GO TO 10                                             XYZ1 530
C***           ***EXTRA CROSS FLOW    1ST TERM OF X(I,I), Y(I,I), Z(I,I)  XYZ1 540
      ECX(J) = 6.283185 * SINA(J) + 2.0 * SINA(J) * COSA(J) * SJ          XYZ1 550
      ECY(J) =-6.283185 * COSA(J) + SJ * T14                              XYZ1 560
```

```
      ECZ(J) = -8.0 * (1.666667 + T2) * SJ                              XYZ1 570
      IF (IEC) 10 , 70 , 10                                             XYZ1 580
   10 IF(PF) GO TO 30                                                   XYZ1 590
      IF (IAC) 40 , 20 , 20                                             XYZ1 600
C                   * AXIS FLOW                                         XYZ1 610
   20 AX(J)=T10+SINA(J)*COSA(J)*(T7+(T4+2.166667   )*T11/12.)           XYZ1 620
      AY(J)=T7*T4-T9-(1.+T2-T3-T6)*T11/8.                               XYZ1 630
      T12=T1+T1                                                         XYZ1 640
      AZ(J)=V2(J)*T8*(1.-T2+T1*(2.-T12+3.*T2*(1.+T12))/144.)            XYZ1 650
   30 IF (IAC) 40 , 40 , 50                                             XYZ1 660
C                   * CROSS FLOW                                        XYZ1 670
   40 T13=T1/16.                                                        XYZ1 680
      CX(J)=T10+2.*SINA(J)*SJ*COSA(J)*(1.-T13*(3.-T5+T2+T2))            XYZ1 690
      CY(J)=-T9+T7*(2.+T4+T13*(1.-4.777778   *T3+T6+T2*(3.-2.666667   * XYZ1 700
     1               T3)))                                              XYZ1 710
      CZ(J)=-T8*(1.+T2-T13*(1.111111   *T3+T2*(T5-1.)))                 XYZ1 720
   50 IF (PF) GO TO 60                                                  XYZ1 730
      IF (FLG15.LE.0.OR.NLF(K).GT.3) GO TO 70                           XYZ1 740
   60 AXV(J) = T9+T7*(T2-T3)+T11*(T2*(12.*T3-9.)                        XYZ1 750
     1          -9. + 23.*T3 - 6.*T3*T3) / 72.                          XYZ1 760
      AYV(J) = T10 + 2.*COSA(J)*SINA(J)*(SJ-T11*(6.*T2+9.-2.*T3)/48. )  XYZ1 770
      IF (.NOT.PF) GO TO 70                                             XYZ1 780
      AX(J) = AXV(J)                                                    XYZ1 790
      AY(J) = AYV(J)                                                    XYZ1 800
C                                                                       XYZ1 810
C*** *  RING WING OPTION PV EFFECTS ON ITSELF NEGLECTS 2*PI TERMS        XYZ1 820
C                                                                       XYZ1 830
      IF(FLG23 .LE. 0)GO TO 70                                          XYZ1 840
      AX(J) = AX(J) - T9                                                XYZ1 850
      AY(J) = AY(J) - T10                                               XYZ1 860
      AYV(J)=AY(J)                                                      XYZ1 870
      AXV(J)=AX(J)                                                      XYZ1 880
   70 CONTINUE                                                          XYZ1 890
C                                                                       XYZ1 900
      IF (PRIN3) WRITE (6, 80 ) J,SJ,AX(J),AY(J),CX(J),CY(J),CZ(J),AXV(JXYZ1 910
     1), AYV(J)                                                         XYZ1 920
      RETURN                                                            XYZ1 930
   80 FORMAT(9H XYZ1. J=,I3,5H, SJ=,F8.5,5H, AX=,F9.5,5H, AY=,F9.5,     XYZ1 940
     1 5H, CX=,F9.5,5H, CY=,F9.5,5H, CZ=,F9.5,6H, AXV=,F9.5,6H, AYV=,   XYZ1 950
     2 F9.5)                                                            XYZ1 960
      END                                                               XYZ1 970
```

```
SO.XYZ3                                                                 25 AUG 75   18
      SUBROUTINE XYZ2                                                   XYZ2  20
C                                                                       XYZ2  10
C                                                                       XYZ2  30
C              * COMPUTE X,Y,Z MATRICES USING SIMPSON RULE INTEGRATION  XYZ2  40
C                                                                       XYZ2  50
      REAL LIJ20                                                        XYZ2  60
      COMMON /D/ R1SQR, R2SQR, XMXJ, YMYJ, XMXJP1, YMYJP1, S            XYZ2  70
      COMMON      HEDR(10)  ,CASE     ,NB       ,NNU                    XYZ2  80
     1                ,FLG03    ,FLG04    ,FLG05    ,FLG06    ,FLG07    XYZ2  90
     2                ,FLG08    ,FLG09    ,FLG10    ,FLG11    ,FLG12    XYZ2 100
     3                ,FLG13    ,FLG14    ,FLG15    ,FLG16    ,FLG17    XYZ2 110
     4                ,FLG18    ,FLG19    ,FLG20    ,FLG21    ,FLG22    XYZ2 120
     5                ,FLG23    ,FLG24    ,FLG25    ,FLG26    ,FLG27    XYZ2 130
      COMMON   NT,       NO(11),    MN,        NUNA(5),   TYPEA(5),     XYZ2 140
     1         NER1,     NER2,      NMA,       NSIGA,     NSIGC,        XYZ2 150
     2         NUNC(5),  TYPEC(5),  NLF(11),   IEC,       NSIGEC,       XYZ2 160
     3         TYPEEC(5),NUNEC(5)                                       XYZ2 170
      DOUBLE PRECISION  HEDR, CASE                                      XYZ2 180
      INTEGER         FLG03     ,FLG04    ,FLG05    ,FLG06    ,FLG07    XYZ2 190
     1                ,FLG08    ,FLG09    ,FLG10    ,FLG11    ,FLG12    XYZ2 200
     2                ,FLG13    ,FLG14    ,FLG15    ,FLG16    ,FLG17    XYZ2 210
     3                ,FLG18    ,FLG19    ,FLG20    ,FLG21    ,FLG22    XYZ2 220
     4                ,FLG23    ,FLG24    ,FLG25    ,FLG26    ,FLG27    XYZ2 230
      COMMON /ECF/ ECX(500), ECY(500), ECZ(500)                         XYZ2 240
      COMMON  /RNGWNG/ VA(500,2),  VR(500,2),VAN(500), VAT(500)         XYZ2 250
      COMMON /EPSBLK/ EPSLON
      COMMON /PRINTF/ PRIN1,PRIN2,PRIN3                                 XYZ2 260
      LOGICAL PRIN1,PRIN2,PRIN3                                         XYZ2 270
      LOGICAL RSMALL                                                    XYZ2 300
      REAL        MN                                                    XYZ2 310
      LOGICAL PF                                                        XYZ2 320
C                                                                       XYZ2 330
      COMMON /CL/     X1(500),  Y1(500),  X2(500),  Y2(500),  DELS(500),XYZ2 340
     1                SINA(500),COSA(500),XP(500),  YP(500)             XYZ2 350
     2                ,XWAKE(11),YWAKE(11)                              XYZ2 360
      COMMON /TL/     A(500),   B(500),   AX(500),  AY(500),  AZ(500),  XYZ2 370
     1                CX(500),  CY(500),  CZ(500),  AXV(500),AYV(500),  XYZ2 380
     2                VN(500,5),VT(500,5),BON,      IAC,                XYZ2 390
     3                I,        J,        J1,       SJ,       DS,       XYZ2 400
     4                DX,       DY,       NI,       XJ,       YJ,       XYZ2 410
     5                XK,       EEK,      EKK,      K,        PF        XYZ2 420
      COMMON /BLOCK3/NOAXI,NOCROS,NOVORT,NOV1,NOV2,FIRSTE,LASTE,LSSE,SO,XYZ2 430
     1 NSMALL                                                           XYZ2 440
      DIMENSION VOAXIX(129),VOAXIY(129),VOCRSX(129),VOCRSY(129),        XYZ2 450
     1 VOCRSZ(129), VOVORX(129),VOVORY(129),XRING(129),YRING(129)       XYZ2 460
      DATA NSW /1/                                                      XYZ2 280
C                                                                       XYZ2 470
C***   ***RSMALL WILL BE TRUE IF IS .LT. EPSLON  AND THEREFORE SMALL ELXYZ2 290
C              * START                                                  XYZ2 480
C              * INITIALIZE                                             XYZ2 490
      ASSIGN 650 TO K1                                                  XYZ2 500
C*** ***K5 = 80 FOR NON-SMALL ELEMENT AXISYMMETRIC                      XYZ2 510
      ASSIGN 270 TO K5                                                  XYZ2 520
C***   ***K6 = 295 FOR NON SMALL ELEMENT   CROSS FLOW                   XYZ2 530
      ASSIGN 450 TO K6                                                  XYZ2 540
      IF (FLG15.LE.0.OR.NLF(K).GT.3) GO TO 10                           XYZ2 550
```

```
      ASSIGN 510 TO K1
   10 S2=.6666667   *DS
      S1 = .3333333 * DS
      S3 = 8.0/3.0 * S1
      S5 = .3333333 * S1
      S4 = S2+S2
      T1=Y2(I)*Y2(I)
      ASSIGN 210 TO K2
      ASSIGN 500 TO K3
      ASSIGN 650 TO K4
      IF( .NOT. PF   ) GO TO 20
      ASSIGN 320 TO K2
      ASSIGN 510 TO K3
      ASSIGN 640 TO K4
   20 IF ( (I .NE. J) .OR. (BON .NE. 0.0) ) GO TO 30
C*** ***I = J ** ON BODY
      R = DELS(I) / 2.0
      RSMALL = ( R / Y2(I)  ) .LT. EPSLON
      NSW = 2
      GO TO 50
   30 R = SQRT( AMAX1(R1SQR,R2SQR) )
      IF( ABS(Y2(I) ) .LT. 1DE-30)GO TO 40
      RSMALL = ( R / Y2(I)  ) .LT. EPSLON
      GO TO 50
   40 RSMALL = .FALSE.
   50 IF( .NOT. RSMALL) GO TO 130
      NSMALL = NSMALL + 1
C*** ***SMALL ELEMENT -- FORM XIJ2D, YIJ2D, LIJ
C
C*** ***K5 = 105 FOR SMALL ELEMENT AXISYMMETRIC
      ASSIGN 300 TO K5
C***    ***K6 = 320 FOR SMALL ELEMENT   CROSS FLOW
      ASSIGN 470 TO K6
C*** ***NSW = 1  FOR I NE J
C*** ***NSW = 2  FOR I EQ J 1ST TIME THROUGH
C*** ***NSW = 3  FOR I EQ J 2ND TIME THROUGH
      GO TO ( 90 , 60 , 70 ), NSW
C
C*** ***I = J  1ST TIME THROUGH
   60 XLEFT = XJ + DX
      YLEFT = YJ + DY
      J1P1  = J + 1
      XRIGHT = X1(J1P1)
      YRIGHT = Y1(J1P1)
C*** ***GET NSW READY FOR I = J  2ND TIME THROUGH
      NSW = 3
      GO TO 80
C*** ***I = J   2ND TIME THROUGH
   70 XLEFT = X1(J1)
      YLEFT = Y1(J1)
      XRIGHT = XLEFT + 32.0 * DX
      YRIGHT = YLEFT + 32.0 * DY
      NSW = 1
C*** ***CALCULATE QUANTITIES WHICH HAVE NOT YET BEEN CALCULATED FOR I=4
   80 XMXJ = X2(I) - XLEFT
      YMYJ = Y2(I) - YLEFT
      XMXJP1 = X2(I) - XRIGHT
```

```
      YMYJP1 = Y2(I) - YRIGHT
      RLEFT = R
      RRIGHT = R
      S = SQRT( (XLEFT - XRIGHT)**2  + (YLEFT - YRIGHT)**2 )
      GO TO 100
C*** ***I NE J  SMALL ELEMENT
   90 RLEFT = R1SQR
      RRIGHT = R2SQR
C*** ***NOW FORM XIJ2D, YIJ2D, LIJ
  100 H = (-XMXJ * SINA(J) ) + ( YMYJ * COSA(J) )
      EL1 = (XMXJ * COSA(J) )+ ( YMYJ * SINA(J) )
      EL2 = (XMYJP1 * COSA(J) ) + (YMYJP1 * SINA(J) )
      DPHIDX =-ALOG (RLEFT / RRIGHT)
      IF(ABS(H/EL1) .LT. 10.0E-10)GO TO 110
      DPHIDY = -2.0 * ( ATAN(EL1/H) - ATAN(EL2/H) )
      GO TO 120
  110 DPHIDY = 0.0
      IF( (EL1 * EL2) .LT. 0.0) DPHIDY = -6.283186
  120 XIJ2D = (COSA(J)*DPHIDX) - (SINA(J)*DPHIDY)
      YIJ2D = (SINA(J)*DPHIDX) + (COSA(J)*DPHIDY)
      LIJ2D = ( (-(EL1 + EL2) / 4.0 ) * DPHIDX )
     1      + ( (S/4.0) * ALOG( (RLEFT *RRIGHT) / ( 4096.0 * T1**2) ) )
     2          -S  - ( (H/2.0) * DPHIDY )
C                   * NO. OF INTERVAL LOOP
  130 DO 780  IS=1,NI
      XJ=XJ+DX
      YJ=YJ+DY
      XRING(IS) = XJ
      YRING(IS) = YJ
      T2=YJ*YJ
      T3=X2(I)-XJ
      T4=T3*T3
      T5=(Y2(I)+YJ)**2
      T6=T4+T5
      T7=SQRT(T6)
      T8=T2+T4
      T9A = Y2(I) - YJ
      T9 = T9A**2
      T10=T9+T4
      T10A = SQRT(T10)
C
C    ***    IF DENOM  (T8)   IS ZERO THEN MAKE T21 FAIL ALL TESTS
C
      IF( ABS(T8) .LT. 10.0E-30)GO TO 140
      T21 = SQRT( T1 / T8 )
      GO TO 150
  140 T21 = 0.10
C                   * COMPUTE ELLIPIC INTEGRAL
  150 IF(RSMALL  .AND.  FLG21 .EQ. 0)GO TO 160
      XK=4.*YJ*Y2(I)/T6
      CALL ELIP
      IF ( IEC ) 160 , 660 , 160
  160 IF (IAC) 330 , 170 , 170
C                   * AXIS FLOW
  170 IF (RSMALL)GO TO 190
      T11 = YJ/T7
      IF ( T21.LT.0.01) GO TO 180
```

```
      T12 = YJ/Y2(I)                                                    XYZ21700
      FV2 = (EKK+EEK*(T1-T8)/T1))/T7                                    XYZ21710
      FV3 = Y2(I)/T10 * T3/T7 * EEK                                     XYZ21720
      F1 = FV3*T12                                                      XYZ21730
      F2 = FV2*T12                                                      XYZ21740
      FV4 = FV2*T3/Y2(I)                                                XYZ21750
      F3=T11*EKK                                                        XYZ21760
      GO TO 200                                                         XYZ21770
  180 FV2 = 0.                                                          XYZ21780
      FV3 = 0.                                                          XYZ21790
      FV4 = 0.                                                          XYZ21800
C***    ***SMALL Y FORMULAS AXISYMMETRIC FLOW                           XYZ21810
      T23 = T1 / T8**2                                                  XYZ21820
      T24 = 2.0 * T4 - T2                                               XYZ21830
      F1 = ( (   1.570796   * YJ * T3 ) / ( T8**1.5          ) ) *      XYZ21840
     1  ( 1.0 + ( .75 * ( 3.0 * T2 - 2.0 * T4 ) * T23 ) )               XYZ21850
      F2 = (   1.570796   * YJ * Y2(I) ) * ( T24 / (T8**2.5        ) )  XYZ21860
      F3 = 1.570796 * YJ * ( 1.0 + (.25 * T23 * (-T24) ) ) / SQRT(T8 )  XYZ21870
      GO TO 200                                                         XYZ21880
  190 T32 = T3 / T10A                                                   XYZ21890
      T33 = T9A / T10A                                                  XYZ21900
      T34 = T33**2                                                      XYZ21910
      T35A = T10A / (8.0 * Y2(I) )                                      XYZ21920
      T35 = ALOG(T35A)                                                  XYZ21930
      T36 = T9A/Y2(I)                                                   XYZ21940
      T40  = T10A / Y2(I)                                               XYZ21950
      T37 = (T40**2)*0.125                                              XYZ21960
      T38 = 0.250*T36*T35                                               XYZ21970
      T39 = 0.125*T36                                                   XYZ21980
      T34A = 2.0*T34                                                    XYZ21990
      T34B = T34A + 3.0                                                 XYZ22000
      F1 = ( -2.0 * T32 * ( (-T35A * T35) - (0.5 * T33)                 XYZ22010
     1       -( (T40/16.0) * T34B ) ) ) / Y2(I)                         XYZ22020
      F2 =-( (0.25 * T36 * T35) -T34 -1.0 - (T39 * T34B) ) / Y2(I)      XYZ22030
      F3 = ( T35 * ( T36 + (0.25 * Y36**2) + T37 ) ) -T36 +T37          XYZ22040
  200 GO TO K2, ( 210 , 320 )                                           XYZ22050
C                 * SIMPSON RULE INTEGRATION                            XYZ22060
  210 IF (IS-1) 220 , 220 , 230                                         XYZ22070
C                 * FIRST PASS                                          XYZ22080
  220 AXS=F1                                                            XYZ22090
      AYS=F2                                                            XYZ22100
      AZS=F3                                                            XYZ22110
      VDAXIX(IS) = -4.*F1                                               XYZ22120
      VCAXIY(IS) = -2.*F2                                               XYZ22130
      IA=0                                                              XYZ22140
      GO TO 320                                                         XYZ22150
  230 IF(IS.EQ.NI)GO TO 260                                             XYZ22160
      IF (IA) 250 , 240 , 250                                           XYZ22170
C                 * EVEN PASS                                           XYZ22180
  240 AXS=AXS+4.*F1                                                     XYZ22190
      AYS=AYS+4.*F2                                                     XYZ22200
      AZS=AZS+4.*F3                                                     XYZ22210
      VDAXIX(IS) = -4.*F1                                               XYZ22220
      VCAXIY(IS) = -2.*F2                                               XYZ22230
      IA=1                                                              XYZ22240
      GO TO 320                                                         XYZ22250
C                 * ODD PASS                                            XYZ22260
```

```
  250 AXS=AXS+F1*F1
      AYS=AYS+F2*F2
      AZS=AZS+F3*F3
      VOAXIX(IS) = -4.*F1
      VCAXIY(IS) = -2.*F2
      IA=0
      GO TO 320
  260 GO TO K5, ( 270 , 300 )
C                 * LAST PASS
  270 IF (J-I) 290 , 280 , 290
  280 IF (BON.NE.0.0) GO TO 290
      AX(J)=AX(J)-S4*(AXS+F1)
      AY(J)=AY(J)-S2*(AYS+F2)
      AZ(J)=AZ(J)+S4*(AZS+F3)
      VOAXIX(IS) = -4.*F1
      VOAXIY(IS) = -2.*F2
      AXJ = -S4*(AXS+F1)
      AYJ = -S2*(AYS+F2)
      GO TO 320
  290 AX(J)=-S4*(AXS+F1)
      AY(J)=-S2*(AYS+F2)
      AZ(J)=S4*(AZS+F3)
      VOAXIX(IS) = -4.*F1
      VOAXIY(IS) = -2.*F2
      AXJ = AX(J)
      AYJ = AY(J)
      GO TO 320
C*** ***LAST PASS  *  SMALL ELEMENT
  300 IF( (J .NE.I) .OR. (BON .NE. 0.0) )GO TO 310
C*** ***I = J   ON BODY
      AX(J) = AX(J) + XIJ2D + (AXS + F1) * S1
      AY(J) = AY(J) + YIJ2D + (LIJ2D / Y2(I) ) + (AYS + F2) * S1
      AZ(J) = AZ(J) -(2.0 * LIJ2D) + (AZS + F3) * S1
      VCAXIX(IS) = -99.
      VCAXIY(IS) = -99.
      AXJ = XIJ2D + (AXS+F1)*S1
      AYJ = YIJ2D + (LIJ2D/Y2(I)) + (AYS+F2)*S1
      GO TO 320
C*** ***I NE J   ON OR OFF BODY
  310 AX(J) = XIJ2D  + (AXS + F1) * S1
      AY(J) = YIJ2D + (LIJ2D / Y2(I) ) + (AYS + F2) * S1
      AZ(J) = -2.0 * LIJ2D + (AZS + F3)  * S1
      VOAXIX(IS) = -99.
      VCAXIY(IS) = -99.
      AXJ = AX(J)
      AYJ = AY(J)
  320 IF (IAC) 330 , 330 , 490
C                * CROSS FLOW
  330 IF (RSMALL)GO TO 350
      IF (T21 .LT. 0.04)GO TO 340
      T12 = T1 + T8
      F1=T3/Y2(I)*(EKK-EEK*T12/T10)/T7
      F2=(EEK*(T8*T8+T1*(T4-T21))/T10-EKK*T8)/T1/T7
      F3=T7*(EKK*T12/T6-EEK)/T1
      GO TO 380
C*** ***SMALL Y FORMULAS  *   CROSS FLOW
  340 T23 = T1 / T8**2
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      T29 = ( 1.570796 * T2 ) / ( T8**1.5       )                       XYZ22840
      T26 = 4.0 * T4 - T2                                               XYZ22850
      T31 = T26 * T23                                                   XYZ22860
      F1 = ( (-4.712389) * T2 * T3 * Y2(I) ) / ( T8**2.5        )       XYZ22870
      F2 = T29 * ( 1.0 - (1.125 * T31 ) )                               XYZ22880
      F3 = T29 * ( 1.0 - (.375 * T31) )                                 XYZ22890
      GO TO 380                                                         XYZ22900
C*** ***IAC LT 0 MEANS NO AXISYMMETRIC FLOW                             XYZ22910
  350 IF(IAC) 360 , 370 , 370                                           XYZ22920
C*** ***CALCULATE SMALL ELEMENT QUANTITIES THAT DID NOT GET CALCULATED   XYZ22930
C*** ***BECAUSE THERE WAS NO AXISYMMETRIC FLOW                          XYZ22940
  360 T32 = T3 / T10A                                                   XYZ22950
      T33 = T9A / T10A                                                  XYZ22960
      T34 = T33**2                                                      XYZ22970
      T35A = T10A / (8.0 * Y2(I) )                                      XYZ22980
      T35 = ALOG(T35A)                                                  XYZ22990
      T36 = T9A/Y2(I)                                                   XYZ23000
      T40  = T10A / Y2(I)                                               XYZ23010
      T37 = (T40**2)*0.125                                              XYZ23020
      T38 = 0.250*T36*T35                                               XYZ23030
C*** ***CALCULATE SMALL ELEMENT F1,F2,F3  CROSS FLOW                    XYZ23040
  370 T38A = -5.0 * T38                                                 XYZ23050
      T40A = T40**2                                                     XYZ23060
      T36A = T36**2                                                     XYZ23070
      F1 = (T32 / Y2(I)) * ( (-0.75 * T40 * T35) + T33                  XYZ23080
     1    +(0.125 * T40 * (2.0 * T34 -5.0) ) )                          XYZ23090
      F2 = ( T38A + T34 + 3.0 + (0.25 * T36 * (T34 - 6.50) ) ) / Y2(I)  XYZ23100
      F3 = ( ( T36 - (0.375 * T40A) - (0.25 * T36A) ) * T35 -4.0 +T36   XYZ23110
     1      -(0.50 * T36A) - T37 ) / Y2(I)                              XYZ23120
C                    * SIMPSON RULE INTEGRATION                         XYZ23130
  380 IF (IS-1) 390 , 390 , 400                                         XYZ23140
C                    * FIRST PASS                                       XYZ23150
  390 CXS=F1                                                            XYZ23160
      CYS=F2                                                            XYZ23170
      CZS=F3                                                            XYZ23180
      IC=0                                                              XYZ23190
      VOCRSX(IS) = 2.*F1                                                XYZ23200
      VOCRSY(IS) = 2.*F2                                                XYZ23210
      VOCRSZ(IS) = 2.*F3                                                XYZ23220
      GO TO 490                                                         XYZ23230
  400 IF (IS-NI) 410 , 440 , 410                                        XYZ23240
  410 IF (IC) 430 , 420 , 430                                           XYZ23250
C                    * EVEN PASS                                        XYZ23260
  420 CXS=CXS+4.*F1                                                     XYZ23270
      CYS=CYS+4.*F2                                                     XYZ23280
      CZS=CZS+4.*F3                                                     XYZ23290
      VOCRSX(IS) = 2.*F1                                                XYZ23300
      VOCRSY(IS) = 2.*F2                                                XYZ23310
      VOCRSZ(IS) = 2.*F3                                                XYZ23320
      IC=1                                                              XYZ23330
      GO TO 490                                                         XYZ23340
C                    * ODD PASS                                         XYZ23350
  430 CXS=CXS+F1+F1                                                     XYZ23360
      CYS=CYS+F2+F2                                                     XYZ23370
      CZS=CZS+F3+F3                                                     XYZ23380
      VOCRSX(IS) = 2.*F1                                                XYZ23390
      VOCRSY(IS) = 2.*F2                                                XYZ23400
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      VOCRSZ(IS) = 2.*F3
      IC=0
      GO TO 490
  440 GO TO K6,( 450 , 470 )
C                   * LAST PASS
  450 IF(J .NE. I)GO TO 460
      IF (BON.NE.0.0) GO TO 460
      CX(J)=CX(J)+S2*(CXS+F1)
      CY(J)=CY(J)+S2*(CYS+F2)
      CZ(J)=CZ(J)+S2*(CZS+F3)
      VOCRSX(IS) = 2.*F1
      VOCRSY(IS) = 2.*F2
      VOCRSZ(IS) = 2.*F3
      CXJ = S2*(CXS+F1)
      CYJ = S2*(CYS+F2)
      CZJ = S2*(CZS+F3)
      GO TO 490
  460 CX(J)=S2*(CXS+F1)
      CY(J)=S2*(CYS+F2)
      CZ(J)=S2*(CZS+F3)
      VOCRSX(IS) = 2.*F1
      VOCRSY(IS) = 2.*F2
      VOCRSZ(IS) = 2.*F3
      CXJ = CX(J)
      CYJ = CY(J)
      CZJ = CZ(J)
      GO TO 490
  470 IF ( (I.NE.J) .OR. (BON .NE. 0.0) ) GO TO 480
C*** ***LAST PASS   SMALL ELEMENT   I=J  ON BODY
      CX(J) = CX(J) + XIJ2D + (CXS + F1) * S1
      CY(J) = CY(J) + YIJ2D + (LIJ2D / Y2(I)) + (CYS + F2) * S1
      CZ(J) = CZ(J) -(2.0 * LIJ2D / Y2(I) )   + (CZS + F3) * S1
      VOCRSX(IS) = -99.
      VOCRSY(IS) = -99.
      VOCRSZ(IS) = -99.
      CXJ = XIJ2D + (CXS+F1)*S1
      CYJ = YIJ2D + (LIJ2D/Y2(I)) + (CYS+F2)*S1
      CZJ = -2.0*LIJ2D/Y2(I)  + (CZS+F3)*S1
      GO TO 490
C*** ***I NE J OR ANY OFF BODY
  480 CX(J) = XIJ2D + (CXS + F1) * S1
      CY(J) = YIJ2D + (LIJ2D/Y2(I)) +(CYS + F2) * S1
      CZ(J) = -(2.0 * LIJ2D / Y2(I) ) + (CZS + F3) * S1
      VOCRSX(IS) = -99.
      VOCRSY(IS) = -99.
      VOCRSZ(IS) = -99.
      CXJ = CX(J)
      CYJ = CY(J)
      CZJ = CZ(J)
C*** ***K3 = 420 FOR SURFACE VORTICITY   PF TRUE
  490 GO TO K3,( 500 , 510 )
C*** ***K1 = 420 FOR STRIP VORTEX
  500 GO TO K1, ( 650 , 510 )
C*** ***FLOW OF CONTROL REACHES HERE FOR (PF=TRUE) OR ( (FLG15 GT 0 AND
C*** ***NLF LE 0 (LIFTING BODY)) AND (I NE J ON BODY OR ANY OFF BODY) )
  510 IF (RSMALL)GO TO 580
      FV1 = (T2-T1) / T7  * EEK / T10
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```
      IF (IS.GT.1) GO TO 520
C                * FIRST PASS
      AX1 = FV1
      AX2 = FV2
      AY1 = FV3
      AY2 = FV4
      VOVORX(IS) = -4.*FV1 - 2.*FV2
      VOVORY(IS) = -4.*FV3 + 2.*FV4
      IV=0
      GO TO 650
  520 IF (IS.EQ.NI) GO TO 550
      IF (IV) 540 , 530 , 540
C                * EVEN PASS
  530 AX1 = AX1+4.*FV1
      AX2 = AX2+4.*FV2
      AY1 = AY1+4.*FV3
      AY2 = AY2+4.*FV4
      VOVORX(IS) = -4.*FV1 - 2.*FV2
      VOVORY(IS) = -4.*FV3 + 2.*FV4
      IV=1
      GO TO 650
C                * ODD PASS
  540 AX1 = AX1+FV1+FV1
      AX2 = AX2+FV2+FV2
      AY1 = AY1+FV3+FV3
      AY2 = AY2+FV4+FV4
      VOVORX(IS) = -4.*FV1 - 2.*FV2
      VOVORY(IS) = -4.*FV3 + 2.*FV4
      IV = 0
      GO TO 650
C                * LAST PASS
  550 IF (J-I) 570 , 560 , 570
  560 IF (BON.NE.0.) GO TO 570
      AXV(J) = AXV(J) - S4*(AX1+FV1) - S2*(AX2+FV2)
      AYV(J) = AYV(J) - S4*(AY1+FV3) + S2*(AY2+FV4)
      VOVORX(IS) = -4.*FV1 - 2.*FV2
      VOVORY(IS) = -4.*FV3 + 2.*FV4
      AXVJ = -S4*(AX1+FV1) - S2*(AX2+FV2)
      AYVJ = -S4*(AY1+FV3) + S2*(AY2+FV4)
      GO TO 630
  570 AXV(J) = -S4*(AX1+FV1) -S2*(AX2+FV2)
      AYV(J) = -S4*(AY1+FV3) +S2*(AY2+FV4)
      VOVORX(IS) = -4.*FV1 - 2.*FV2
      VOVORY(IS) = -4.*FV3 + 2.*FV4
      AXVJ = AXV(J)
      AYVJ = AYV(J)
      GO TO 630
  580 T34C = T34B - 8.0
      FV1 = ( T38 + (T32**2) - (T39 * T34C) ) / Y2(I)
      FV2 = ( T32 / Y2(I) ) * ( (-3.75 * T40 * T35) +T33
     I      +(0.125 * T40 * T34C) )
      IF (IS .GT.1)GO TO 590
C*** ***FIRST PASS  SMALL ELEMENT
      AX1 = FV1
      AY1 = FV2
      VOVORX(IS) = -99.
      VOVORY(IS) = -99.
```

```
      IV = 0
      GO TO 650
  590 IF(IS .EQ. NI)GO TO 610
      IF(IV .NE. 0 )GO TO 600
C*** ***EVEN PASS   SMALL ELEMENT
      AX1 = AX1 + 4.0* FV1
      AY1 = AY1 + 4.0* FV2
      VOVORX(IS) = -99.
      VOVORY(IS) = -99.
      IV = 1
      GO TO 650
C*** ***ODD PASS    SMALL ELEMENT
  600 AX1 = AX1 + FV1 + FV1
      AY1 = AY1 + FV2 + FV2
      VOVORX(IS) = -99.
      VOVORY(IS) = -99.
      IV = 0
      GO TO 650
C*** ***LAST PASS   SMALL ELEMENT
  610 IF ( (I .NE. J) .OR. (BON .NE. 0.0) )GO TO 620
C*** ***I = J   ON  BODY
      AXV(J) = AXV(J) - YIJ2D + (LIJ2D / Y2(I) ) + (AX1 + FV1)*S1
      AYV(J) = AYV(J) + XIJ2D + (AY1 + FV2)*S1
      VOVORX(IS) = -99.
      VOVORY(IS) = -99.
      AXVJ = -YIJ2D + (LIJ2D/Y2(I)) + (AX1+FV1)*S1
      AYVJ = XIJ2D + (AY1+FV2)*S1
      GO TO 630
C*** ***I NE J  OR  ANY OFF BODY
  620 AXV(J) = -YIJ2D   + (LIJ2D / Y2(I) ) + (AX1 + FV1)*S1
      AYV(J) = XIJ2D +(AY1 + FV2)*S1
      VOVORX(IS) = -99.
      VOVORY(IS) = -99.
      AXVJ = AXV(J)
      AYVJ = AYV(J)
C*** ***K4 = 560 FOR SURFACE VORTICITY   PF TRUE
  630 GO TO K4,( 640 , 650 )
C*** ***FLOW OF CONTROL REACHES HERE IF PF IS TRUE
  640 AX(J) = AXV(J)
      AY(J) = AYV(J)
      VOVORX(IS) = -99.
      VOVORY(IS) = -99.
  650 IF (IEC.EQ.-1) GO TO 780
  660 IF (T21.LT.0.08)GO TO 680
      T20 = SQRT( T2 / (T1 + T4) )
      IF (T20.LT.0.01) GO TO 670
      T13 = YJ * Y2(I)**2
      T14 = T1 + T8
      T15 = T2 * T1
      T16 = T14 * T14
      T17 = T1 * YJ
      T18 = T1 * T1
      T19 = T8 * T8
      F3 = ( T7/T13 ) * ( (-T14) * EEK + ( ( (T16 - T15) * EKK) / T6 )
      F1 =(T3 / (T17 *T7) ) * ( (EEK / T10 ) * (T16 - 3.0 * T15) -
     1 (T14 * EKK) )
      TEMP1 =((-8.0*T8**3) - (12.0*T1*T19) + (26.0*T15*T8)
```

```
      1    + (2.0*T18*(2.0*T1 -5.0*T2) ))* EEK/T10
        TEMP2 = EKK * ( (8.0*T19) + (4.0*T1*T8) - (2.0*T15) - (4.0*T18) )
        F2 = (TEMP1 + TEMP2) / ( T13 * T7)
        GO TO 690
C***     ***SMALL YJ FORMULAS    *   EXTRA CROSS FLOW
  670 T25 = YJ**3
        T30 = T4 + T1
        T27 = T30**3.5
        T28 = T25 * Y2(I)
        F1 = (    2.945243   * T25 * T3 * T1) / T27
        F2 =    7.068584   * T28 * ( 3.0 * T1   -   2.0 * T4  ) / T27
        F3 = 1.767146 * T28 /(T30**2.5      )
        GO TO 690
C***     ***SMALL Y FORMULAS    *   EXTRA CROSS FLOW
  680 T25 =  YJ**3
        F1 = (    2.945243   * T25 * T3 * T1  ) / ( T8**3.5
        F2 = ( (-14.137717) * T25 * Y2(I) ) / (T8**2.5)
        F3 = -F2 / 8.0
C***     ***SIMPSON'S RULE
  690 IF (IS - 1) 700 , 700 , 710
C***     ***FIRST PASS
  700 ECXS = F1
        ECYS = F2
        ECZS = F3
        IE = 0
        GO TO 780
  710 IF (IS - NI) 720 , 750 , 720
  720 IF ( IE ) 740 , 730 , 740
C***     ***EVEN PASS
  730 ECXS = ECXS + 4.0 * F1
        ECYS = ECYS + 4.0 * F2
        ECZS = ECZS + 4.0 * F3
        IE = 1
        GO TO 780
C***     ***ODD PASS
  740 ECXS = ECXS + F1  + F1
        ECYS = ECYS + F2  + F2
        ECZS = ECZS + F3  + F3
        IE = 0
        GO TO 780
C***     ***LAST PASS
  750 IF(J - I) 770 , 760 , 770
C***     ***I=J      *      ELEMENTS ON MAIN DIAGONAL
  760 IF (BON.NE.0.0) GO TO 770
        ECX(J) = ECX(J) -S4 * ( ECXS + F1 )
        ECY(J) = ECY(J) -S5 * ( ECYS + F2 )
        ECZ(J) = ECZ(J) +S3 * ( ECZS + F3 )
        GO TO 780
C***     ***OFF MAIN DIAGONAL OR OFF BODY POINTS
  770 ECX(J) = -S4 * ( ECXS + F1 )
        ECY(J) = -S5 * ( ECYS + F2 )
        ECZ(J) =  S3 * ( ECZS + F3 )
  780 CONTINUE
        IF (.NOT. PRIN3) RETURN
        WRITE (6, 810 ) I,J,NI,DS,X2(I),Y2(I)
        WRITE (6, 790 ) (L,XRING(L),YRING(L),VDAXIX(L),VDAXIY(L),
      1  VDCRSX(L),VDCRSY(L),VDCRSZ(L),VDVORX(L),VDVORY(L),L=1,NI)
```

```
      WRITE (6, 800 ) AXJ,AYJ,CXJ,CYJ,CZJ,AXVJ,AYVJ                     XYZ25690
      RETURN                                                            XYZ25700
C                                                                       XYZ25710
C                                                                       XYZ25720
  790 FORMAT(4H0  L,7X,5HXRING,8X,5HYRING,10X,6HVDAXIX,7X,6HVDAXIY,     XYZ25730
     1 10X,6HVDCRSX,7X,6HVDCRSY,7X,6HVDCRSZ,10X,6HVDVORX,7X,6HVCVORY//  XYZ25740
     2 (1H ,I3,2F13.5,3X,2F13.6,3X,3F13.6,3X,2F13.6))                   XYZ25750
  800 FORMAT(24H0RESULTS OF SIMPSON-RULE,9X,2F13.6,3X,3F13.6,3X,2F13.6, XYZ25760
     1 /1H0)                                                            XYZ25770
  810 FORMAT(12H0XYZ2.    I=,I3,4H, J=,I3,5H, NI=,I3,5H,                XYZ25780
     1 5H, DS=,F10.6,7H, X(I)=,F10.5,7H, Y(I)=,F10.5)                   XYZ25790
      END                                                               XYZ25800
```

Program COMBYN


```
C     THE MAIN PROGRAM FOR APPROACH 5 COMBYN                          0000
C                                                                   A 0010
      COMMON /MONOF/ JJS,JJ                                         A 0020
      COMMON /RDOUT4/ NTHETA,THETA(10),XTEST(10),N,ISWIRL,TSWIRL(400) A 0030
      COMMON /DSEE3D/ RANG(400,10),REX(400,10),IPLOT(10),ICASE      A 0040
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI              A 0050
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTMA 0060
     1IN,NSPLT,YWING                                                A 0070
      COMMON /RDOUT2/ T(400,2),VYAX(200,2),VYCR(200),V2(400),V3(400),V2CA 0080
     1R(200)                                                        A 0090
      COMMON /RDOUT3/ VXAX(200,2),VXCR(200)                         A 0100
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT,CUTOFF        A 0110
      COMMON/CNTRYL/ YTESTH,YTESTS,NO1,NO2,ON3,ON4,ON5
      COMMON /COUT1/ OCA,PTC,PSPTCI,PIO180,ATOTAL,GRHO              A 0120
      COMMON /COUT2/ VINFP,RHOTOT,VIC                               A 0130
      COMMON /GETOUT/ VMAG(3),ALIL,BLIL,CLIL                        A 0140
      COMMON /TOUT1/ SINTH,COSTH,OMEGA                              A 0150
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP    A 0160
      COMMON /RSAVE/ XDUM(400),YDUM(400),XAFF(200),YAFF(200)        A 0170
     1 ,MO,JA,IR,NRUNNO,MO2,JA2,IR2,NRUNO2                          A 0180
      COMMON/BOD/DELQ                                               A 0190
      ICASE=0                                                       A 0200
   10 CALL READS                                                    A 0210
      VSAVE=VINF                                                    A 0220
      IF (VINF.EQ.0.0) GO TO 15                                     A 0230
      VINF=VINF*(1.0-.2*(VINF/ATOTAL)**2)**2.5                      A 0240
   15 VCSAVE=VC                                                     A 0250
      VC=VIC                                                        A 0260
      CALL GETABC                                                   A 0270
      VC=VCSAVE                                                     A 0280
      VINFP=VINF                                                    A 0290
      VINF=VSAVE                                                    A 0300
      WRITE (6,35)VMAG(1),VMAG(2),ALIL,BLIL,CLIL,VINFP              A 0310
      CALL AVEV                                                     A 0320
      REWIND 2                                                      A 0330
      REWIND 3                                                      A 0340
      DO 30 N=1,NTHETA                                              A 0350
      WRITE (6,40)N,NTHETA                                          A 0360
      READ (3) WDOTT,VICT                                           A 0370
      IF (NX.NE.-1) GO TO 20                                        A 0380
      WRITE(4) VC,VINF,ALFAF,TTOTAL                                 A 0390
      WRITE(4) THETA(N)                                             A 0400
   20 WRITE (6,45)THETA(N),WDOTT,VICT,VMAG(3)                       A 0410
      IF (NTHETA.EQ.0) WRITE (6,25)ISWIRL                           A 0420
   25 FORMAT(91HO 3-D STREAMLINES WILL BE FOLLOWED BEGINNING AT THIS VALA 0430
     1UE OF THETA, NEAR THE FAN FACE, I=          ,I4)              A 0440
      THETA(N)=THETA(N)*PIO180                                      A 0450
      SINTH=SIN(THETA(N))                                           A 0460
      CSINTH=CLIL*SINTH                                             A 0470
      COSTH=COS(THETA(N))                                           A 0480
      CCOSTH=CLIL*COSTH                                             A 0490
      OMEGA=UTIP/YTESTS                                             A 0500
      CALL ONOFF                                                    A 0510
   30 CONTINUE                                                      A 0520
      IF(NX.EQ.-1) CALL INFRCE                                      A 0530
      GO TO 10                                                      A 0540
```

```
C*****
C*** FORMATS
C*****
C
  35 FORMAT (97H           V1           V2           A
 1 B           C           VINFP           /5X,1P6E14.3)
  40 FORMAT (1H0,4X,I2,4H OF ,I2,7H THETAS/1H0)
  45 FORMAT (3X,8HTHETA = ,E12.5,13H     WDOTT = ,1PE12.5,12H      VICT
 1= ,1PE12.5,10H     V3 = ,1PE12.5)
     END
```

```
50.ASINC                                                    19 OCT 76   17
      1.        FUNCTION ARSIN(X)                                  V    0000
      2.        ARSIN=ASIN(X)                                      V    0010
      3.        RETURN                                             V    0020
      4.        END                                                V    0030
```

```
      SUBROUTINE AVEV
C
C     APPROACH 5
C
      COMMON /MONOF/ JJS,JJ
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
     1IN,NSPLT,YWING
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /RDOUT2/ T(400,2),VYAX(200,2),VYCR(200),V2(400),V3(400),VZC
     1R(200)
      COMMON /RDOUT3/ VXAX(200,2),VXCR(200)
      COMMON /RDOUT4/ NTHETA,THETA(10),XTEST(10),N,ISWIRL,TSWIRL(400)
      COMMON /DSEE3D/ RANG(400,10),REX(400,10),IPLOT(10),ICASE
      COMMON/FORCE/ S(400),VOFFS(600),                     VRES(100),
     1VX(100),Y(100),X(100),NRI
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP
      COMMON /COUT2/ VINFP,RHOTOT,VIC
      COMMON /GETOUT/ VMAG(3),ALIL,BLIL,CLIL
      COMMON/CNTRYL/ YTESTH,YTESTS,NOTHET
      DIMENSION IBEGIN(25),          VBAR(400), A(400), VBAROF(200), RH
     1OBAR(400), RBROFF(200), RBORT(400), RBFORT(200)
      DIMENSION IED(25)
      REWIND 2
      REWIND 3
      PI=3.14159265
      PIO180=PI/180.
      G=32.174
      AC=PI*(YTESTS**2-YTESTH**2)/144.
      ATOTAL=49.*SQRT(TTOTAL)
      FACTR=(144./G)/RHOTOT
      NSHR=NTMIN-NHUBMX+1
      NBP1=NHUBMX+1
      IF(NTHETA.EQ.0)ICASE=ICASE+1
      IPLOT(ICASE)=0
C*****
C*** FIND THE HIGH-LIGHT ON THE SHROUD
C*****
      DO 10 I=NBP1,NTMIN
      JJ=I
      IF (XON(I).LE.XON(I+1)) GO TO 15
   10 CONTINUE
C*****
C*** MODIFICATION FOR SPLITTER TO FIND THE LAST POINT ON THE SHROUD
C*****
   15 DO 20 I=JJ,NTMIN
      JJS=I
      IF (XON(I).GT.XON(I+1)) GO TO 25
   20 CONTINUE
C*****
C*** FIND AREAS FOR POINTS ON THE SHROUD THEN INTERPOLATE FOR ALL
C***      OTHER POINTS
C*****
   25 NHUBP1=NHUBMX+1
      IF (NSPLT.EQ.0) GO TO 35
      DO 30 IN=1,NSPLT
```

```
      IED(IN)=NSPB(IN+1)-1
   30 IF (IN.EQ.NSPLT) IED(IN)=NTHIN
C*****
C***  FIND AREA FOR EVERY POINT ON THE SHROUD
C*****
   35 DO 55 I=NHUBP1,JJS
      YS=YON(I)
      XS=XON(I)
      IF (I.GT.JJ) GO TO 50
      ARS=0.0
      IF (NSPLT.EQ.0) GO TO 45
C*****
C***  IF THERE ARE SPLITTERS, SUBTRACT AREA OF SPLITTERS FROM OVERALL AR
C*****
      DO 40 IN=1,NSPLT
      NSB=NSPB(IN)
      NSE=NSPE(IN)
      IF (XS.LT.XON(NSE).OR.XS.GT.XON(NSB)) GO TO 40
      CALL SINTP (XON(NSB),YON(NSB),NSE-NSB+1,XS,YSP1)
      CALL SINTP (XON(NSE),YON(NSE),IED(IN)-NSE,XS,YSP2)
      ARS=PI*(YSP2**2-YSP1**2)+ARS
   40 CONTINUE
   45 CALL SINTP (XON,YON,NHUBMX,XS,YH)
      A(I)=PI*(YS**2-YH**2)-ARS
      GO TO 55
   50 R=SQRT(YS**2+(XS-XON(JJ))**2)
      RADZAK=YON(JJS)-YON(JJ)
      IF(RADZAK.EQ.0.)RADZAK=.0001
      A(I)=(1.0+(YS-YON(JJ))/RADZAK            )*PI*R*(R+XS-XON(JJ))
      IF(A(I).LE.A(I-1))A(I)=A(I-1)*1.05
   55 CONTINUE
C*****
C***  INTERPOLATE AREAS FROM THE POINTS ON THE SHROUD TO OBTAIN
C***    REMAINING AREAS
C*****
      NCNTH=0
      DO 65 I=1,NTHIN
      IF (I.GE.NHUBP1.AND.I.LE.JJS) GO TO 65
      IF (XON(I).LT.XON(JJ)) GO TO 60
      XA=XON(I)
      CALL SINTP (XON(NHUBP1),A(NHUBP1),JJ-NHUBMX,XA,AX)
      A(I)=AX
      GO TO 65
   60 NCNTH=NCNTH+1
   65 CONTINUE
   70 DO 140 N=1,NTHETA
      IF(ISWIRL.NE.0)
     1ISWIRL(ISWIRL)=THETA(1)
      IF(NTHETA.EQ.0)CALL SRINE(XON,YON,XRI,YRIHUB,YRISHR,NHUBMX,NTHIN,S
     1)
      THETA(N)=THETA(N)*PI0180
      COSTH=COS(THETA(N))
      CCOSTH=CLIL*COSTH
      SINTH=SIN(THETA(N))
      CSINTH=CLIL*SINTH
      VICT=VIC+CLIL*VMAG(3)*COSTH*(1-NOTHET)
      WOOT1=G*RHOTOT*VICT*AC
```

```
      FACTOR=FACTR*WDOTT
      IF (NCNTH.EQ.0) GO TO 80
      VINFA=VINFP
      IF(VINFP.EQ.0.)VINFA=1.E-6
      AINFP=FACTOR/VINFA
      DO 75 I=1,NCNTH
      A(I)=   AINFP+ (A(JJ       )-AINFP)*(XON(I)-XON(1))/(XON(JJ)-XON(1))
   75 CONTINUE
   80 WRITE (3) WDOTT,VICT
C*****
C***  CALCULATE VBAR FOR EVERY POINT ON BODY
C*****
      ISTOP=NTMIN
      SLOPC = (XON(JJS)-XON(JJ))/(YON(JJS)-YON(JJ))
C(((((((((((( VBAR CALCULATION MODIFIED 12/20/73 ((((((((((((((((((((((
C((((((((((((   AND REVISED - 3/30/75  ((((((((((((((((((((((((((((((((((
C((((((( IF A POINT IS PAST STAGNATION (VP.GT.0) AND IS ON THE SHROUD, AN
C(((((( FREESTREAM VEL. IS GT VICT, THEN, VBAR= FREESTREAM. IF THIS TEST
C((((( FAILS, VBAR CAN STILL BE SET TO FREESTREAM, PROVIDED -
C(((((   VBAR.LT.FREESTREAM.LT.VICT
C
C     ONBODY RHOBAR AND VRES CALCULATIONS
C
      RRSRTF=RHOTOT*(1.0-.2*(VINF/ATOTAL)**2)**2.5
      RSORTC=(1.0-.2*(VC/ATOTAL)**2)**2.5
      DO 100 I=1,NTMIN
      VP=ALIL*T(I,1)+BLIL*T(I,2)+CCOSTH*V2(I)
      VTH=CSINTH*V3(I)
      IF (NTHETA.NE.0.OR.I.LE.ISWIRL) GO TO 65
      VEETH=V3(I-1)*CLIL*SIN(TSWIRL(I-1)*3.14159265/180.)
      VEEP=    ALIL*T(I-1,1)+BLIL*T(I-1,2)+CLIL*V2(I-1)*COS(TSWIRL(I-1)*
     13.14159265/180.)
      SOLD=SQRT((YON(I)-YON(I-1))**2+(XON(I)-XON(I-1))**2)
      TSWIRL(I)=TSWIRL(I-1)-SOLD/YON(I)*VEETH/VEEP/PIO180
      S(I)=S(I-1)-SOLD/ABS(VEEP)*SQRT(VEEP**2+VEETH**2)
      VQ=VP-V2(I)*CLIL*(COSTH-COS(TSWIRL(I)*3.14159265/180.))
      IF(VQ.LT.1.3*VEEP.AND.VQ.LT.0.)VQ=-VEEP
      IF(VEEP  *VQ   .LE.0.)S(I)=SOLD+S(I-1)
      IF(VEEP  *VQ   .LT.0.)TSWIRL(I)=TSWIRL(I-1)
      VP=VP-V2(I)*CLIL*(COSTH-COS(TSWIRL(I)*3.14159265/180.))
      VTH=VTH*SIN(TSWIRL(I)*3.14159265/180.)/SINTH
      IF (XON(I).GT.XON(ISWIRL)) GO TO 85
      IPLOT(ICASE)=IPLOT(ICASE)+1
      ICOUNT=IPLOT(ICASE)
      RANG(ICOUNT,ICASE)=TSWIRL(I)
      REX(ICOUNT,ICASE)=XON(I)
      IF(I.GT.JJ)REX(ICOUNT,ICASE)=-REX(ICOUNT,ICASE)
C
C     ORIGINAL VRESON
C
   85 VRESON=SQRT(VP**2+VTH**2)
      RESVV=VRESON
C((((( NEW TEST -
      IF (VP.GT.0..AND.VINFP.NE.0..AND.I.GT.NHUBMX.AND.I.LE.JJS.AND.VINF
     1P.GE.VICT) GO TO 90
C
C     APPROACH 5 VRESON
```

```
C
      VBAR(I)=FACTOR/A(I)
      IF (VBAR(I).LT.VINFP.AND.VINFP.LT.VICT.AND.VINFP.NE.0..AND.I.GT.NHG
     1UBMX) GO TO 90
      CALL VBARIT (VBAR(I),ATOTAL,RHOTOT,RHOBAR(I))
      GO TO 95
   90 VBAR(I)=VINFP
      RHOBAR(I)=RRSRTF
   95 RBORT(I)=RHOBAR(I)/RHOTOT
      VRESON=VRESON*(1.0/RBORT(I))**(VRESON/VBAR(I))
      VP=VRESON*VP/RESVV
      VTH=VRESON*VTH/RESVV
      WRITE (3) VRESON,VP,VTH
  100 CONTINUE
      WRITE (2) (VBAR(I),RBORT(I),I=1,NTHIN)
C
C     OFF BODY POINTS A AND VBAR
C
      J=1
      IBEGIN(J)=1
      NRAKES=1
      DO 110 I=1,NPMIN
      IF (ABS(XOFF(I+1)-XOFF(I)).GT..01) GO TO 105
      GO TO 110
  105 IF (I.EQ.NPMIN) GO TO 110
      J=J+1
      IBEGIN(J)=I+1
      NRAKES=J
  110 CONTINUE
      DO 130 I=1,NRAKES
      IB=IBEGIN(I)
C*****
C*** FIND AREA FOR OFF-BODY RAKES
C*****
      IF (XOFF(IB).LE.XON(JJ)) GO TO 115
      CALL SINTP (XON(NHUBP1),A(NHUBP1),JJ-NHUBMX,XOFF(IB),AR)
      GO TO 120
  115 AR=A(JJ)
  120 VB=FACTOR/AR
      CALL VBARIT (VB,ATOTAL,RHOTOT,RHB)
      IE=IBEGIN(I+1)-1
      IF (I.EQ.NRAKES) IE=NPMIN
      DO 125 J=IB,IE
      VBAROF(J)=VB
      RBROFF(J)=RHB
  125 CONTINUE
  130 CONTINUE
      DO 135 I=1,NPMIN
C
C     ORIGINAL VRESOF
C
      VXC=ALIL*VXAX(I,1)+BLIL*VXAX(I,2)+CCOSTH*VXCR(I)
      VYC=ALIL*VYAX(I,1)+BLIL*VYAX(I,2)+CCOSTH*VYCR(I)
      VZC=CSINTH*VZCR(I)
      VRESOF=SQRT(VXC**2+VYC**2+VZC**2)
      RESVV=VRESOF
C
```

```
C     APPROACH 5 VRESOF
      RBFORT(I)=RBROFF(I)/RHOTOT
      VRESOF=VRESOF*(1.0/RBFORT(I))**(VRESOF/VBAROF(I))
      VXC=VRESOF*VXC/RESVV
      VYC=VRESOF*VYC/RESVV
      VZC=VRESOF*VZC/RESVV
      WRITE (3) VRESOF,VXC,VYC,VZC
  135 CONTINUE
      WRITE (2)(VBAROF(I),RBFORT(I),I=1,NPMIN)
      THETA(N)=THETA(N)/PIO180
  140 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE BEFORC(PSOPTC,PSOPT)
      COMMON/ROW/RHOST
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTM
     1IN,NSPLT,YWING
      COMMON /COUT1/ QCA,PTC,PSPTCI,PI0180,ATOTAL,GRHO
      COMMON /ONOUT/ VRESON(400),VP(400),BETAON(400)
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /VOUTI/ PSOPC(100),PHII(100),ZETAI(100),VYI(100),CPC(100),V
     1ZI(100),VMI(100),VAFTI(100),VSPANI(100),ETAI(100)
      COMMON /RDOUT4/ NTHETA,THETA(10),XTEST(10)
      COMMON/FORCE/ S(400),VAFT(200),VXC(200),VRESOF(200),VRES(100),
     1VX(100),Y(100),X(100),NRI
      DIMENSION PSOPTC(1),PSOPT(1)
      DIMENSION PSOP(400)
      EQUIVALENCE (PSOP(1),PSOPC(1))
      IKEEP=0
      DO 10 II=1,NHUBMX
      IF (XON(II).GT.XTEST(1)) GO TO 10
      IKEEP=II+1
   10 CONTINUE
      WRITE(4) IKEEP
      WRITE(4) (XON(I2),YON(I2),PSOPTC(I2),
     1PSOPT(I2),
     2                                          S(I2),VRESON(I2),I2=1,IKEEP)
      IKP=0
      NHUBP1=NHUBMX+1
      DO 25 I3=NHUBP1,NTMIN
      IF (IKP.EQ.1) GO TO 25
      IF (YON(I3).GT.YWING) GO TO 20
      IF (XON(I3).GT.XTEST(1).AND.XON(I3+1).LE.XTEST(1)) GO TO 15
      GO TO 25
   15 IBGS=I3
      GO TO 25
   20 INDS=I3
      IKP=1
   25 CONTINUE
      KLIM=INDS-IBGS+1
      WRITE(4) KLIM
      WRITE(4) (XON(I4),YON(I4),PSOPTC(I4),
     1PSOPT(I4),
     2                                          S(I4),VRESON(I4),I4=IBGS,INDS
     1)
      RETURN
      ENTRY OFFORC(PSOPTC,PSOPT)
      KKT=NCHI-NCLO+3
      WRITE(4) KKT
      WRITE(4)  X(NRI),Y(NRI),VX(NRI),VRES(NRI),PSOPC(NRI),PSOP(NRI),
     1VAFTI(NRI)
      WRITE(4) (XOFF(I5),YOFF(I5),VXC(I5),VRESOF(I5),PSOPTC(I5),PSOPT(I5
     2)
     1,VAFT(I5),I5=NCLO,NCHI)
      NRI=NRI+1
      WRITE(4)  X(NRI),Y(NRI),VX(NRI),VRES(NRI),PSOPC(NRI),PSOP(NRI),
     1VAFTI(NRI)
```

```
57.      RETURN                                              K    0560
58.      END                                                 K    0570
```

```
EODF-FARREL*SOREL2(1).CONSTAN
      SUBROUTINE CONST                                                  C 0000
C                                                                       C 0010
C     THIS SUBROUTINE CALCULATES MOST OF THE CONSTANTS USED IN COMBYN   C 0020
C                                                                       C 0030
      COMMON/ROW/RHOST                                                  C 0040
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT,CUTOFF            C 0050
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI                  C 0060
      COMMON/FLAGS/IVORT,IGEOM,ISIG,ICURV,NONEWF,IDENT                  C 0070
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,NND,YRIHUB,YRISHR,UTIP        C 0080
      COMMON/BOP/WDOTCR                                                 C 0090
      COMMON /COUT1/ QCA,PTC,PSP1CI,PIO180,ATOTAL,GRHO                  C 0100
      COMMON /COUT2/ VINFP,RHOTOT,VIC                                   C 0110
      COMMON /WRT/ KSKIP,NT(2),NP(2)                                    C 0120
      COMMON /RDOUT4/ NTHETA,THETA(10),XTEST(10),N,ISWIRL,TSWIRL(400)   C 0130
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTMC 0140
     1IN,NSPLT,YWING                                                    C 0150
      COMMON/CNTRYL/ YTESTH,YTESTS,NOTHET,ICTLPT,VCP,VCPBAR,RHOCCP      C 0160
      REAL MC,MA,MINF                                                   C 0170
      PI=3.14159265                                                     C 0180
      R21568=1715.63                                                    C 0190
      G=32.174                                                          C 0200
      REWIND 4                                                          C 0210
      PSTATC=PSTAT                                                      C 0220
      PIO180=PI/180.                                                    C 0230
      IF (PSTAT.NE.0.0.AND.TSTAT.NE.0.0) GO TO 10                       C 0240
      IF (PT.EQ.0.0) PT=2116.22                                         C 0250
      IF (TTOTAL.EQ.0.0) TTOTAL=518.67                                  C 0260
      ATOTAL=49.*SQRT(TTOTAL)                                           C 0270
      CATOT=1.0-.2*(VINF/ATOTAL)**2                                     C 0280
      PSTATC=PT*CATOT**3.5                                              C 0290
      PTC=PT                                                            C 0300
      RHOTOT=PT/(R21568*TTOTAL)                                         C 0310
      TSTAT=TTOTAL*CATOT                                                C 0320
      RHOST=PSTATC/(R21568*TSTAT)                                       C 0330
      PSTAT=PT-.5*RHOTOT*VINF*VINF                                      C 0340
      ASTAT=49.*SQRT(TSTAT)                                             C 0350
      GO TO 15                                                          C 0360
   10 ASTAT=49.0*SQRT(TSTAT)                                            C 0370
      RHOST=PSTAT/(R21568*TSTAT)                                        C 0380
      AMINF=VINF/ASTAT                                                  C 0390
      CAMINF=1.0+.2*AMINF**2                                            C 0400
      PTC=PSTAT*CAMINF**3.5                                             C 0410
      PSTAT=PTC-.5*RHOTOT*VINF*VINF                                     C 0420
      PT=PTC                                                            C 0430
      TTOTAL=TSTAT*CAMINF                                               C 0440
      RHOTOT=PT/(R21568*TTOTAL)                                         C 0450
      ATOTAL=49.*SQRT(TTOTAL)                                           C 0460
   15 AC=PI*(YTESTS**2-YTESTH**2)/144.                                  C 0470
      VSONIC=ATOTAL/1.728
      VSONCC=ATOTAL/SQRT(1.2)
      IF (WDOT.EQ.0.0) GO TO 25                                         C 0510
      VIC=WDOT/(G*RHOTOT*AC)                                            C 0520
      VICC=ATOTAL/1.728                                                 C 0530
C*****                                                                  C 0540
C***  FOR D. BREUNLIN TAKE OUT FOLLOWING THREE(3) CARDS   8/30/71       C 0550
C*****                                                                  C 0560
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      C     IF(VIC.LE.VICC) GO TO 25                                          C   0570
      C     VIC = VICC                                                        C   0580
      C     WDOT = RHOTOT*VICC*AC*G                                           C   0590
            CALL VBARIT (VIC,ATOTAL,RHOTOT,RHOC)                              C   0600
      C - - - IF WDOT CANNOT BE RECONSTRUCTED USING VIC, THEN VBARIT HAS LOWERC   0610
      C - - - VIC, AND VC=VSONIC, AND WDOT MUST BE LOWERED TO CHOKING FLOW    C   0620
            IF (VIC*G*RHOTOT*AC.LT..999*WDOT) WRITE (6,115)WDOT                C
            IF(VIC*G*RHOTOT*AC.LT..999*WDOT)WDOT=VIC*G*RHOTOT*AC               C
      C - - - IF A CONTROL PT INDEX WAS INPUT, USE PRESS RATIO (STORED IN VC) C   0650
      C - - -  A VBAR AND RHOBAR THERE FOR A,B,C CALCULATIONS.                C   0660
            IF (ICTLPT.EQ.0) GO TO 20                                         C   0670
            VCP=ATOTAL*SQRT(5.*(1.-VC**(1./3.5)))                             C   0680
            POPTCP=VC                                                         C   0690
            YCPH=0.                                                           C   0700
            IF(XON(ICTLPT).GE.XON(1))CALL SINTP(XON,YON,NHUBMX,XON(ICTLPT),YCPC   0710
           1H)                                                                C   0720
            VCPBAR=WDOT/(G*RHOTOT*PI/144.*(YON(ICTLPT)**2-YCPH**2))           C   0730
            CALL VBARIT(VCPBAR,ATOTAL,RHOTOT,RHOCCP)                          C   0740
         20 VC=WDOT/(G*RHOC*AC)                                               C   0750
      25    IF(VC.GT.VSONCC)WRITE(6,116) VC
            IF(VC.GT.VSONCC)VC=VSONCC
            IF (VA.EQ.0.0) VA=VC                                              C   0760
      C*****                                                                  C   0770
      C***  TESTS FOR NORMALIZING PARAMETERS (ELND)                           C   0780
      C***      IF KND = -1, ELND =YRISHR                                     C   0790
      C***                 0, SET ELND = 1.0 AND SKIP NONDIMENSIONAL CALCULATIOC   0800
      C***                 1, ELND = YRISHR - YRIHUB                          C   0810
      C***                 2, USE READ IN VALUE OF ELND                       C   0820
      C***                 4,5,6 USE VA FOR NONDIMENSIONALIZING VELOCITIES    C   0830
      C*****                                                                  C   0840
            IF (KND.GE.8) GO TO 35                                            C   0850
         30 IF (KND.EQ.-1.OR.KND.EQ.4) ELND=YTESTS                            C   0860
            IF (KND.EQ.1.OR.KND.EQ.6) ELND=YTESTS-YTESTH                      C   0870
            IF (KND.EQ.0.OR.KND.EQ.5) ELND=1.0                                C   0880
            XRI=XRI/ELND                                                      C   0890
            YRIHUB=YRIHUB/ELND                                                C   0900
            YRISHR=YRISHR/ELND                                                C   0910
            YTESTS=YTESTS/ELND                                                C   0920
            YTESTH=YTESTH/ELND                                                C   0930
            YWING=YWING/ELND                                                  C   0940
            WDOT=WDOT/ELND/ELND                                               C   0950
            AC=AC/ELND/ELND
         35 RTTOT=R21568*TTOTAL                                               C   0960
            GRHO=32.174*PT/RTTOT                                              C   0970
            C102RT=.5/RTTOT                                                   C   0980
            IF (PSTAT.NE.0.0) C102RT=.5*RHOST/PT                              C   0990
            VCOVA=VC/VA                                                       C   1000
            VIOVA=VINF/VA                                                     C   1010
            VNFOVC=VINF/VC                                                    C   1020
            VFOAT=VINF/ATOTAL                                                 C   1030
            VCOAT=VC/ATOTAL                                                   C   1040
            VAOAT=VA/ATOTAL                                                   C   1050
            CON1=1.0-.2*VCOAT**2                                              C   1060
            CON2=1.0-.2*VFOAT**2                                              C   1070
            CON3=1.0-.2*VAOAT**2                                              C   1080
            RSORTF=CON2**2.5                                                  C   1090
            RSORTA=CON3**2.5                                                  C   1100
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      RSORTC=CON1**2.5                                                  C  1110
      IF (WDOT.EQ.0.0) VIC = VC*RSORTC                                  C  1120
      IF(WDOT.EQ.0.) WDOT=VIC*G*RHOTOT*AC                               C  1130
      PSPTC=1.0-C102RT*VC**2                                            C  1160
      PSPTIF=1.0-C102RT*VINF**2                                         C  1170
      PSPTCI=RSORTF*CON2                                                C  1180
      PSPTCC=RSORTC*CON1                                                C  1190
      PSPTCA=RSORTA*CON3                                                C  1200
      PSPTA=1.0-C102RT*VA**2                                            C  1210
      MINF=VFOAT/(CON2**.5)                                             C  1220
      MC=VCOAT/(CON1**.5)                                               C  1230
      MA=VAOAT/(CON3**.5)                                               C  1240
      QINF=PT*(1.0-PSPTIF)                                              C  1250
      QCINF=PTC*(.7*VFOAT**2*RSORTF)                                    C  1260
      QC=PT*(1.0-PSPTC)                                                 C  1270
      QCC=PTC*(.7*VCOAT**2*RSORTC)                                      C  1280
      QA=PT*(1.0-PSPTA)                                                 C  1290
      QCA=PTC*(.7*VAOAT**2*RSORTA)                                      C  1300
      THETC=TTOTAL/518.67                                               C  1310
      DEL=PTC/2116.22                                                   C  1320
      HBTPR=YTESTH/YTESTS                                               C  1330
      WDOTCR=WDOT*SQRT(THETC)/DEL                                       C  1340
      WRITE (4)NCLO,NCHI,NTMIN,NPMIN,RHOST,(XTEST(IU),IU=1,10)          C  0480
      WRITE(4) YTESTH,YTESTS,YWING                                      C  0490
      WRITE(4) NTHETA                                                   C  0500
      WRITE (6,50)                                                      C  1350
      WRITE (6,55)VC,MC,QC,QCC,PSPTC,PSPTCC,RSORTC                      C  1360
      WRITE (6,60)VA,MA,QA,QCA,PSPTA,PSPTCA,RSORTA                      C  1370
      WRITE (6,65)VINF,MINF,QINF,QCINF,PSPTIF,PSPTCI,RSORTF             C  1380
      WRITE (6,70)                                                      C  1390
      WRITE (6,75)ALFAF,VNFOVC,VIOVA,VCOVA,VSONIC,VSONCC,WDOTCR         C  1400
      WRITE (6,80)                                                      C  1410
      WRITE (6,85)TSTAT,PSTAT,PSTATC,ASTAT,RHOST,WDOT,VIC               C  1420
      WRITE (6,70)                                                      C  1430
      WRITE (6,90)TTOTAL,PT,PTC,ATOTAL,RHOTOT,THETC,DEL                 C  1440
      WRITE (6,80)                                                      C  1450
      IF (ICTLPT.EQ.0) GO TO 40                                         C  1460
      WRITE (6,120)ICTLPT,POPTCP,VCP,VCPBAR,RHOCCP                      C  1470
      GO TO 45                                                          C  1480
   40 WRITE (6,70)                                                      C  1490
   45 WRITE (6,100)XR1,YR1HUB,YR1SHR,HBTPR,ELND,CUTOFF                  C  1500
      WRITE (6,70)                                                      C  1510
      WRITE (6,105)XTEST(1),YTESTH,YTESTS,YWING                         C  1520
      WRITE (6,80)                                                      C  1530
      WRITE (6,110)NT(1),NP(1),NCLO,NCHI,NHUBMX,NX,KND,KSKIP,NOTHET,ISWIC  1540
     2RL,NT(2),NP(2)                                                    C  1550
C                                                                       C  1560
C     FORMATS                                                           C  1570
C                                                                       C  1580
      RETURN                                                            C  1590
C                                                                       C  1600
   50 FORMAT (1H0,27X,58HMACH          DYNAMIC PRESSURE             PREC  1610
     1SSURE RATIO/107H          VELOCITY          NO          INC,      C  1620
     2     COMP.        INC.          COMP.      DENSITY RATIO)         C  1630
   55 FORMAT (11H  CONTROL   ,1PE10.3,1P6E14.3)                         C  1640
   60 FORMAT (11H  BULK      ,1PE10.3,1P6E14.3)                         C  1650
   65 FORMAT (11H  FREE      ,1PE10.3,1P6E14.3/8H  STREAM)              C  1660
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```
      70 FORMAT (1H0)
      75 FORMAT (87H              ALFAF          VINF/VC        VINF/VA        VC
     1/VA         VSONIC        VSONICC,14H         WDOTCR/
     4                                      5X,1P7E14.3)
      80 FORMAT (1H0,110H-----------------------------------------------------
     1--------------------------------------------------------- /)
      85 FORMAT (100H              TSTAT          PSTAT          PSTATC
     1 ASTAT         RHOSTAT        WDOT           VIC/9X,1PE10.3,1P6E14.3
     2)
      90 FORMAT (101H              TTOT           PTOT           PTOTC
     1 ATOT          RHOTOT         THET           DEL/5X,1P7E14.3)
      95 FORMAT (1H0,6E12.5)
     100 FORMAT (94H              XRI           YRIHUB         YRISHR     HUB-T
     1IP RATIO          LND    P-S PLOT CUTOFF/5X,1P6E14.3)
     105 FORMAT (62H              XTEST          YTESTH          YTESTS
     1  YWING/5X,1P4E14.3)
     110 FORMAT (94H              NT           NP     NCLO    NCHI    NHUBMX
     1 NX     KND     KSKIP    NOTHET    ISWIRL/
     2                  10X,1H1,I4,5X,1H1,I5,4X,I3,5X,I3,6X,I3,6X,I2,4
     3X,I2,6X,I2,8X,I2,8X,I2/
     4                  10X,1H2,I4,5X,1H2,I5)
     115 FORMAT(22H - - - - WEIGHT FLOW= ,E15.6,' EXCEEDS CHOKED FLOW.'  /
     1 ' PROCEEDING WITH CHOKING VALUE LISTED BELOW')
 116   FORMAT('OCONTROL STATION VELOCITY= ',E13.4,' EXCEEDS VSONIC'/
     1' PROCEEDING WITH VC=VSONIC.  IF YOUR CONTROL STATION ',
     2/' IS NOT AT THE THROAT, RESUBMIT WITH A LOWER VC')
     120 FORMAT(75H CONTROL PT INDEX      PRESS. RATIO        VCP         VB
     1AR             RHOCCP /1X,11H(FOR A,B,C) ,1X,I4,1P4E14.3/)
         END

@BRKPT PRINT$
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```
      SUBROUTINE GETABC
C*****
C***  COMPUTES V1 , V2 , V3 , A , B , C  FROM INPUT PARAMETERS
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTME
     1IN,NSPLT,YWING
      COMMON/CNTRYL/ YTESTH,YTESTS,NOTHET,ICTLPT,VCP,VCPBAR,RHOCCP
      COMMON /COUT2/ VINFP,RHOTOT,VIC
      COMMON /RDOUT2/ T(400,2),VYAX(200,2),VYCR(200),V2(400),V3(400),VZC
     1R(200)
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON/FLAGS/IVORT,IGEOM,ISIG,ICURV,NONEWF,IDENT
      COMMON /RDOUT3/ VXAX(200,2),VXCR(200)
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PI
      COMMON /GETOUT/ VMAG(3),ALIL,BLIL,CLIL
      COMMON /GEABC/ YI
      DIMENSION VXAXH(2), VXAXS(2)
      NAMELIST/CCC/ VMAG,ARE,ESS,ALFAF
      NAMELIST/BBB/ VMAG,V2
      PI0180=3.14159265/180.
      ALFAF=ALFAF*PI0180
C*****
C***   COMPUTE V1 , V2 , V3
C*****
      IF (ICTLPT.NE.0.AND.ALFAF.NE.999.*PI0180) GO TO 55
      IF (XOFF(NCLO).LT.XON(1)) GO TO 20
C
C     SEARCH ON HUB COUNTING BACKWARDS
C
      J=NHUBMX
   10 IF (XON(J).LT.XOFF(NCLO)) GO TO 15
      J=J-1
      GO TO 10
   15 J=J+1
      XH=XOFF(NCLO)
      IFLAG=1
      CALL INTPOL (1,J,XH,IFLAG,VX,DUM,DUM,DUM)
      VXAXH(1)=VX
      CALL INTPOL (2,J,XH,IFLAG,VX,DUM,DUM,DUM)
      VXAXH(2)=VX
      CALL INTPOL (3,J,XH,IFLAG,VXCRH,DUM,DUM,DUM)
      YH=YI
      GO TO 25
   20 YH=0.0
      VXAXH(1)=0.0
      VXAXH(2)=0.0
      VXCRH=0.0
C*****
C***   SEARCH ON SHROUD COUNTING FORWARDS
C*****
   25 K=NHUBMX+1
   30 IF (XON(K).LT.XOFF(NCHI)) GO TO 35
      K=K+1
      GO TO 30
   35 K=K-1
      XS=XOFF(NCHI)
      IFLAG=1
```

```
      CALL INTPOL (1,K,XS,IFLAG,VX,DUM,DUM,DUM)
      VXAXS(1)=VX
      CALL INTPOL (2,K,XS,IFLAG,VX,DUM,DUM,DUM)
      VXAXS(2)=VX
      CALL INTPOL (3,K,XS,IFLAG,VXCRS,DUM,DUM,DUM)
      YS=YI
      ILOW=NCLO+1
      IHIGH=NCHI-1
C
C     AXIAL COMPONENT VELOCITY *** AXISSYMETRIC SOLUTION
C
      DO 45 L=1,2
      SUM=YH*VXAXH(L)*(YOFF(NCLO)-YH)+VXAX(NCLO,L)*YOFF(NCLO)*(YOFF(NCLO
     1+1)-YH)
      DO 40 I=ILOW,IHIGH
      SUM=SUM+VXAX(I,L)*YOFF(I)*(YOFF(I+1)-YOFF(I-1))
   40 CONTINUE
      SUM=SUM+YOFF(NCHI)*VXAX(NCHI,L)*(YS-YOFF(NCHI-1))+(-1.0)*YS*VXAXS(
     1L)*(YS-YOFF(NCHI))
      VMAG(L)=SUM/(YS**2-YH**2)
   45 CONTINUE
C
C     AXIAL COMPONENT CROSSFLOW VELOCITY SOLUTION
C
      SUM=YH*VXCRH*(YOFF(NCLO)-YH)+VXCR(NCLO)*YOFF(NCLO)*(YOFF(NCLO+1)-Y
     1H)
      DO 50 I=ILOW,IHIGH
      SUM=SUM+VXCR(I)*YOFF(I)*(YOFF(I+1)-YOFF(I-1))
   50 CONTINUE
      SUM=SUM+YOFF(NCHI)*VXCR(NCHI)*(YS-YOFF(NCHI-1))+(-1.0)*YS*VXCRS*(Y
     1S-YOFF(NCHI))
      VMAG(3)=SUM/(YS**2-YH**2)
   55 CLIL=VINF*COS(ALFAF)
      IF (IVORT.EQ.1) GO TO 60
      ALIL=(VC+VINF*SIN(ALFAF)*VMAG(2))/(VMAG(1)-VMAG(2))
      BLIL=(VC+VINF*SIN(ALFAF)*VMAG(1))/(VMAG(2)-VMAG(1))
      GO TO 85
   60 ALIL =-VINF*SIN(ALFAF)
      BLIL= (VC - ALIL*VMAG(1))/VMAG(2)
      IF (ICTLPT.EQ.0) GO TO 85
      RHORAT=RHOCCP/RHOTOT
      VCPINC=VCP
   65 VTEST=VCPINC+(VCP*(RHORAT)**(VCPINC/VCPBAR)-VCPINC)/(1.-VCPINC*ALO
     1G(RHORAT)/VCPBAR)
      IF (ABS((VCPINC-VTEST)/VCPINC).LE.1.E-05) GO TO 70
      VCPINC=VTEST
      GO TO 65
   70 BLIL=(VCPINC+ALIL*T(ICTLPT,1)-CLIL*V2(ICTLPT))/(-T(ICTLPT,2))
      IF (ALFAF.EQ.999.*PIO180) GO TO 75
      VMAG(1)=-T(ICTLPT,1)
      VMAG(2)=-T(ICTLPT,2)
      VMAG(3)=-V2(ICTLPT)
      GO TO 85
   75 ARE=-VC/VMAG(2)*T(ICTLPT,2)-VCPINC
      ESS=-T(ICTLPT,1)+VMAG(1)/VMAG(2)*T(ICTLPT,2)
      CLIL=(-ARE*V2(ICTLPT)-ESS*SQRT(VINF*VINF*(V2(ICTLPT)**2+ESS*ESS)-
     1ARE*ARE))/(V2(ICTLPT)**2+ESS*ESS)
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```
      VIF=VINF
      IF(VINF.EQ.0.)VIF=CLIL
      ALIL=SQRT(VIF*VIF-CLIL*CLIL)
      BLIL=(VC-ALIL*VMAG(1))/VMAG(2)
      ALFAF=ATAN(CLIL/ALIL)-90.*PIO180
      ALF=ALFAF/PIO180
      WRITE (6,80)ALF
   80 FORMAT('0  ALFAF HAS BEEN CALCULATED FROM WDOT,VINF, AND CONTROL PE
     1OINT PRESSURE = ',E12.4,' DEG')
   85 ALFAF=ALFAF/PIO180
      RETURN
      END
```

```
      SUBROUTINE INFRCE
C
C     INLET FORCE CALCULATION
C
      DIMENSION XTEST(10)
      DIMENSION                                VABS(4),VORD(4)
      DIMENSION XHB(200),YH(200),PSPTHC(200),PSOPTH(200),SDH(200)
     1,XSR(200),YS(200),PSPTSC(200),PSOPTS(200),SDS(200),XHC(220),
     2XH(220),XSC(200),XS(200)
      DIMENSION VRESH(200),CPCH(200),VRESS(200)
      DIMENSION        SUBFCH(20),SUBFH(20),SUBFCS(20),SUBFS(20),
     3SUBAFH(20),SUBAFS(20),SUBLHC(20),SUBLH(20),SUBLSC(20),SUBLS(20),
     4SUBALH(20),SUBALS(20),THETA(20),SUBMHC(20),SUBMH(20),SUBMSC(20),
     5SUBMS(20),SUBDHC(20),SUBDH(20),SUBDSC(20),SUBDS(20),SBMDHC(20),
     6SBMDH(20),SBMDSC(20),SBMDS(20),YWINGG(10)
      DIMENSION XOFF(100),YOFF(100),VXC(100),VRES(100),PSOPC(100),
     1PSOP(100),SUBDFX(100),SUBDXC(100),VAFT(100)
      DIMENSION SUBARI(20),SUBFRI(20),SUBFRC(20),SUBWDT(20),SUBWDC(20)
     1,SUBMFX(20),SUBMFC(20),SUBMM(20),SUBMMC(20)
      COMMON/FLAGS/IVORT,IGEOM,ISIG,ICURV,NONEWF,CASENO
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIH,  YRIS,  UTIP
      COMMON /COUT1/ QCA,PTC,PSPTCI,PIO180,ATOTAL,GRHO
      REAL MFLUX,MFLUXC,MMFLX,MMFLXC
      REAL MRESHC,MRESH,MRESSC,MRESS,LRFSHC,LRESH,LRESSC,LRESS
      REAL MINF,MC,LHC,LH,LSC,LS,MLHC,MLH,MLSC,MDS,MDSC,MDH,MDHC,MLS
      REAL LTC,LT,MLTC,MLT,MDTC,MDT,MRTC,MRT,LRTC,LRT,MFLXP,MFLXPC
     1,LIFT,LIFTC
      COMMON /JAN1/ NL,KK,J
      DATA VABS/6H      ,6H      ,6H      ,6H      /,VORD/6H      ,6H
     1      ,6H      ,6H      /
      DATA CAPR/1715.63/,G/32.174/
      PIO180 = 3.14159265/180.
C     READ (5,1003) Z0,CASENO,NWING,(YWINGG(I),I=2,NWING)
      Z0=0.
      NWING=1
   10 FORMAT (F8.2,A6,2X,I8,7F8.2)
      ITEST = 0
      DO 110 IY=1,NWING
      REWIND 4
      READ(4) NCLO,NCHI,NTMIN,NPMIN,RHOST,(XTEST(IU),IU=1,10)
      READ(4)        YRIHUB,YRISHR,YWINGG(1)
      READ(4)        NTHETA
   15 YWING = YWINGG(IY)
      DO 105 N=1,NTHETA
      READ(4)        VC,VINF,ALFAF,TTOTAL
      ALFAF=ALFAF*PIO180
C
C     THETA IN DEGREES
C
      READ(4)        THETA(N)
      THETA(N)= THETA(N)*PIO180
      READ(4)        II
      READ(4)      (XHB(I),YH(I),PSPTHC(I),PSOPTH(I),SDH(I),VRESH(I),
     1I=1,II)
      READ(4)        JJ
```

```
      READ(4)      (XSR(I),YS(I),PSPTSC(I),PSOPTS(I),SDS(I),VRESS(I),
     1I=1,JJ)
      IF (IY.EQ.1) GO TO 25
      JJJ = 0
      DO 20 I=1,JJ
      IF (YS(I).GT.YWING) GO TO 20
      JJJ = JJJ + 1
   20 CONTINUE
      JJ = JJJ + 1
   25 READ(4) NOFF
      READ (4) XOFF(1),YOFF(1),VXC(1),VRES(1),PSOPC(1),PSOP(1),VAFT(1)
      NOFM1 = NOFF-1
      READ (4) (XOFF(I),YOFF(I),VXC(I),VRES(I),PSOPC(I),PSOP(I),
     1 VAFT(I),I=2,NOFM1)
      READ (4) XOFF(NOFF),YOFF(NOFF),VXC(NOFF),VRES(NOFF),PSOPC(NOFF),
     1 PSOP(NOFF),VAFT(NOFF)
      II= II+1
      IM = II-1
      I= II
      DO 30 L=1,IM
      PSPTHC(I)= PSPTHC(I-1)
      PSOPTH(I)= PSOPTH(I-1)
      SDH(I) = SDH(I-1)
      XHB(I) = XHB(I-1)
      YH(I) = YH(I-1)
      VRESH(I) = VRESH(I-1)
      CPCH(I) = CPCH(I-1)
   30 I = I-1
   35 NL = 1
      J = II
      KK= 1
      CALL LGRNGE (YH,PSPTHC,YRIHUB,ANS)
      PSPTHC(II)=ANS
      CALL LGRNGE (YH,PSOPTH,YRIHUB,ANS)
      PSOPTH(II)= ANS
      CALL LGRNGE (YH,SDH,YRIHUB,ANS)
      SDH(II)= ANS
      CALL LGRNGE (YH,XHB,YRIHUB,ANS)
      XHB(II)= ANS
      YH(II)= YRIHUB
       J=JJ
      CALL LGRNGE (YS,PSPTSC,YRISHR,ANS)
      PSPTSC(1) = ANS
      CALL LGRNGE (YS,PSPTSC,YWING,ANS)
      PSPTSC(JJ)= ANS
      CALL LGRNGE (YS,PSOPTS,YRISHR,ANS)
      PSOPTS(1)= ANS
      CALL LGRNGE (YS,PSOPTS,YWING,ANS)
      PSOPTS(JJ)= ANS
      CALL LGRNGE (YS,SDS,YRISHR,ANS)
      SDS(1)= ANS
      CALL LGRNGE (YS,SDS,YWING,ANS)
      SDS(JJ)= ANS
      CALL LGRNGE (YS,XSR,YRISHR,ANS)
      XSR(1)= ANS
      CALL LGRNGE (YS,XSR,YWING,ANS)
      XSR(JJ)= ANS
```

```
      YS(I)= YRISHR
      YS(JJ) = YWING
      YH(I) = 0.0
      SDH(1) = SDH(2) - YH(2)
C
C     CALC CONSTANT VALUES
C
      RHOT = PT/(CAPR*TTOTAL)
      RHORAT = RHOT/RHOST
      IF (PSTAT.NE.0.0) RHOT = RHOST
      IF (PSTAT.EQ.0.0) RHORAT = 1.0
      ATOTAL = 49.0*SQRT(TTOTAL)
      CON2 = VC/ATOTAL
      RCORT = (1.0-.2*CON2**2)**2.5
      PA  = PT-.5*RHOT*VINF**2
      CON1= 1.0-.2*(VINF/ATOTAL)**2
      PAC =PTC*CON1**3.5
      MINF =(VINF/ATOTAL)/(CON1**.5)
      MC = CON2/((1.0-.2*CON2**2)**.5)
C
C     WRITE ( INPUT AND CONSTANTS
C
      IF (N.EQ.1) WRITE (6,175)CASENO,YRIHUB,YRISHR,YWING,VC,VINF,ALFAF,
     1TTOTAL,RHOT,PA,PAC,MINF,MC,NTHETA
C     WRITE (6,2018) THETA(N),(XHD(I),YH(I),PSPTHC(I),PSOPTH(I),SDH(I),
C    1 VRESH(I),CPCH(I),I=1,II)
C     WRITE (6,2022) (XSR(I),YS(I),PSPTSC(I),PSOPTS(I),SDS(I),
C    1 VRESS(I),CPCS(I),I=1,JJ)
C     WRITE(6,2023) (XOFF(I),YOFF(I),VXC(I),VAFT(I),PSOPC(I),PSOP(I),VRE
C    1S(I),CPC(I),I=1,NOFF)
      DO 40 I=1,II
      XHC(I)= PSPTHC(I)*YH(I)
   40 XH(I)= PSOPTH(I)*YH(I)
      DO 45 J=1,JJ
      XSC(J)= PSPTSC(J)*YS(J)
      XS(J)= PSOPTS(J)*YS(J)
   45 CONTINUE
      CALL TRAP(SDH,XHC,ANS,II)
      SUBFCH(N) = ANS
      CALL TRAP (SDH,XH,ANS,II)
      SUBFH(N)= ANS
      CALL TRAP (SDS,XSC,ANS,JJ)
      SUBFCS(N)= ANS
      CALL TRAP (SDS,XS,ANS,JJ)
      SUBFS(N)= ANS
      CALL TRAP(SDH,YH,ANS,II)
      SUBAFH(N)=ANS
      CALL TRAP (SDS,YS,ANS,JJ)
      SUBAFS(N)= ANS
      CALL TRAP(YH,XHC,ANS,II)
      SUBLHC(N) = ANS
      CALL TRAP(YH,XH,ANS,II)
      SUBLH(N)= ANS
      CALL TRAP(YS,XSC,ANS,JJ)
      SUBLSC(N)=ANS
      CALL TRAP(YS,XS,ANS,JJ)
      SUBLS(N)=ANS
```

```
      CALL TRAP(YH,YH,ANS,II)
      SUBALH(N)=ANS
      CALL TRAP(YS,YS,ANS,JJ)
      SUBALS(N)=ANS
      PACOPT = PAC/PTC
      PAOPT= PA/PT
      DO 50 I=1,II
      XHC(I)=          -PSPTHC(I) *YH(I)**2
      XH(I)=          -PSOPTH(I) *YH(I)**2
   50 CONTINUE
      DO 55 J=1,JJ
      XSC(J)=          -PSPTSC(J) *YS(J)**2
      XS(J)=          -PSOPTS(J) *YS(J)**2
   55 CONTINUE
      COST = COS(THETA(N))
      CALL TRAP(YH,XHC,ANS,II)
      SUBMHC(N)= COST*ANS
      CALL TRAP(YH,XH,ANS,II)
      SUBMH(N)= COST*ANS
      CALL TRAP(YS,XSC,ANS,JJ)
      SUBMSC(N)= COST*ANS
      CALL TRAP(YS,XS,ANS,JJ)
      SUBMS(N)= COST*ANS
      DO 60 I=1,II
      XHC(I) = PSPTHC(I)*YH(I)
      XH(I) = PSOPTH(I)*YH(I)
   60 CONTINUE
      DO 65 J=1,JJ
      XSC(J) = PSPTSC(J)*YS(J)
      XS(J) = PSOPTS(J)*YS(J)
   65 CONTINUE
      CALL TRAP(XHB,XHC,ANS,II)
      SUBDHC(N)= COST*ANS
      CALL TRAP(XHB,XH,ANS,II)
      SUBDH(N)= COST*ANS
      CALL TRAP(XSR,XSC,ANS,JJ)
      SUBDSC(N)=COST*ANS
      CALL TRAP(XSR,XS,ANS,JJ)
      SUBDS(N)= COST*ANS
      DO 70 I=1,II
      XHC(I)= PSPTHC(I)          *YH(I)*(XHB(I)-Z0)
   70 XH(I)= PSOPTH(I)          *YH(I)*(XHB(I)-Z0)
      DO 75 J=1,JJ
      XSC(J)= PSPTSC(J)          *YS(J)*(XSR(J)-Z0)
   75 XS(J)= PSOPTS(J)          *YS(J)*(XSR(J)-Z0)
      CALL TRAP(XHB,XHC,ANS,II)
      SBMDHC(N)= ANS*COST
      CALL TRAP(XHB,XH,ANS,II)
      SBMDH(N)=ANS*COST
      CALL TRAP(XSR,XSC,ANS,JJ)
      SBMDSC(N)= ANS*COST
      CALL TRAP(XSR,XS,ANS,JJ)
      SBMDS(N)=ANS*COST
C
C     ROTOR INLET CALCS   OFF-BODY POINTS FROM COMBYN
C
      CALL TRAP(YOFF,YOFF,ANS,NOFF)
```

```
      SUBARI(N) = ANS
      DO 80 I=1,NOFF
      XSC(I) = PSOPC(I)*YOFF(I)
   80 XS(I) = PSOP(I)*YOFF(I)
      CALL TRAP (YOFF,XS,ANS,NOFF)
      SUBFRI(N) = ANS
      CALL TRAP (YOFF,XSC,ANS,NOFF)
      SUBFRC(N) = ANS
      DO 85 I=1,NOFF
      XS(I) = VXC(I)*YOFF(I)
   85 XSC(I) = PSOPC(I)**(1.0/1.4)*XS(I)
      CALL TRAP(YOFF,XS,ANS,NOFF)
      SUBWDT(N) = ANS
      CALL TRAP(YOFF,XSC,ANS,NOFF)
      SUBWDC(N) = ANS
      DO 90 I=1,NOFF
      XS(I) = XS(I)*VXC(I)
   90 XSC(I) = XSC(I)*VXC(I)
      CALL TRAP (YOFF,XS,ANS,NOFF)
      SUBMFX(N) = ANS
      CALL TRAP (YOFF,XSC,ANS,NOFF)
      SUBMFC(N) = ANS
      DO 95 I=1,NOFF
      XS(I) = XS(I)*YOFF(I)
   95 XSC(I) = XSC(I)*YOFF(I)
      CALL TRAP (YOFF,XS,ANS,NOFF)
      SUBMH(N) = COST*ANS
      CALL TRAP (YOFF,XSC,ANS,NOFF)
      SUBMHC(N) = COST*ANS
      DO 100 I=1,NOFF
      XS(I) = VXC(I)*VAFT(I)*YOFF(I)
      XSC(I) = XS(I)*PSOPC(I)**(1.0/1.4)
  100 CONTINUE
      CALL TRAP (YOFF,XS,ANS,NOFF)
      SUBDFX(N) = ANS
      CALL TRAP (YOFF,XSC,ANS,NOFF)
      SUBDXC(N) = ANS
  105 CONTINUE
      ARIXT = 3.14159265*(YOFF(NOFF)**2-YOFF(1)**2)/144.
      ALXCTH = 3.14159265*(YRIHUB**2)/144.
      ALXCTS = 3.14159265*(YWING**2-YRISHR**2)/144.
      TO144=2.0/144.
      CON3= -TO144*PT
      CON3C = -TO144*PTC
      CALL TRAP(THETA,SUBFCH,ANS,NTHETA)
      FHC=ANS*CON3C
      CALL TRAP (THETA,SUBFH,ANS,NTHETA)
      FH = ANS*CON3
      CALL TRAP (THETA,SUBFCS,ANS,NTHETA)
      FSC=-ANS*CON3C
      CALL TRAP(THETA,SUBFS,ANS,NTHETA)
      FS=-ANS*CON3
      CALL TRAP(THETA,SUBAFH,ANS,NTHETA)
      AFH= ANS*TO144
      CALL TRAP (THETA,SUBAFS,ANS,NTHETA)
      AFS=-ANS*TO144
      PACAFH = PAC*AFH
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```
      PAAFH = PA*AFH
      PACAFS = PAC*AFS
      PAAFS = PA*AFS
      FHC = FHC + PACAFH
      FH = FH + PAAFH
      FSC = FSC + PACAFS
      FS = FS + PAAFS
      CALL TRAP (THETA,SUBLHC,ANS,NTHETA)
      LHC= CON3C*ANS
      CALL TRAP (THETA,SUBLH,ANS,NTHETA)
      LH = CON3*ANS
      CALL TRAP (THETA,SUBLSC,ANS,NTHETA)
      LSC= CON3C*ANS
      CALL TRAP (THETA,SUBLS,ANS,NTHETA)
      LS  = CON3*ANS
      CALL TRAP (THETA,SUBALH,ANS,NTHETA)
      ALH= TO144*ANS
      CALL TRAP (THETA,SUBALS,ANS,NTHETA)
      ALS = TO144*ANS
      PACALH = PAC*ALH
      PAALH = PA*ALH
      PACALS = PAC*ALS
      PAALS = PA*ALS
      LHC = LHC + PACALH
      LH = LH + PAALH
      LSC = LSC + PACALS
      LS = LS + PAALS
      TO1728= 2.D/1728.
      CALL TRAP (THETA,SUBMHC,ANS,NTHETA)
      MLHC =-ANS*TO1728*PTC
      CALL TRAP(THETA,SUBMH,ANS,NTHETA)
      MLH=-ANS*TO1728*PT
      CALL TRAP (THETA,SUBMSC,ANS,NTHETA)
      MLSC=-ANS*TO1728*PTC
      CALL TRAP (THETA,SUBMS,ANS,NTHETA)
      MLS=-ANS*TO1728*PT
      CALL TRAP (THETA,SUBDHC,ANS,NTHETA)
      DHC = CON3C*ANS
      CALL TRAP (THETA,SUBDH,ANS,NTHETA)
      DH = CON3*ANS
      CALL TRAP (THETA,SUBDSC,ANS,NTHETA)
      DSC =  CON3C*ANS
      CALL TRAP (THETA,SUBDS,ANS,NTHETA)
      DS =  CON3*ANS
      CALL TRAP (THETA,SBMDHC,ANS,NTHETA)
      MDHC= TO1728*PTC*ANS
      CALL TRAP (THETA,SBMDH,ANS,NTHETA)
      MDH= TO1728*PT*ANS
      CALL TRAP (THETA,SBMDSC,ANS,NTHETA)
      MDSC= TO1728*PTC*ANS
      CALL TRAP (THETA,SBMDS,ANS,NTHETA)
      MDS= TO1728*PT*ANS
C
C     SECOND INTEGRATION FOR OFF BODY POINTS
C
      CONS = TO1728*G*RHOT
      CON4 = TO144*G*RHOT
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      CON7 = T01728*RHOT                                    P    3410
      CON6 = T0144*RHOT                                     P    3420
      CALL TRAP (THETA,SUBARI,ANS,NTHETA)                   P    3430
      ARI = T0144*ANS                                       P    3440
      CALL TRAP (THETA,SUBFRI,ANS,NTHETA)                   P    3450
      FRI = PA*ARI+CON3*ANS                                 P    3460
      CALL TRAP (THETA,SUBFRC,ANS,NTHETA)                   P    3470
      FRIC = PAC*ARI+CON3C*ANS                              P    3480
      CALL TRAP (THETA,SUBWDT,ANS,NTHETA)                   P    3490
      WDOT = CON4*ANS                                       P    3500
      CALL TRAP (THETA,SUBWDC,ANS,NTHETA)                   P    3510
      WDOTC = CON4*ANS * RHORAT                             P    3520
      CALL TRAP (THETA,SUBMFX,ANS,NTHETA)                   P    3530
      MFLUX = CON6*ANS                                      P    3540
      CALL TRAP (THETA,SUBMFC,ANS,NTHETA)                   P    3550
      MFLUXC = CON6*ANS  * RHORAT                           P    3560
      CALL TRAP (THETA,SUBMM,ANS,NTHETA)                    P    3570
      MMFLX = CON7*ANS                                      P    3580
      CALL TRAP (THETA,SUBMMC,ANS,NTHETA)                   P    3590
      MMFLXC = CON7*ANS * RHORAT                            P    3600
      CALL TRAP (THETA,SUBDFX,ANS,NTHETA)                   P    3610
      DFLUX = ANS*CON6                                      P    3620
      CALL TRAP (THETA,SUBDXC,ANS,NTHETA)                   P    3630
      DFLUXC = ANS*CON6* RHORAT                             P    3640
      RHC = SQRT(LHC**2+DHC**2)                             P    3650
      RH = SQRT(LH**2+DH**2)                                P    3660
      RSC = SQRT(LSC**2+DSC**2)                             P    3670
      RS = SQRT(LS**2+DS**2)                                P    3680
      MRESHC = MLHC + MDHC                                  P    3690
      MRESH = MLH + MDH                                     P    3700
      MRESSC = MLSC + MDSC                                  P    3710
      MRESS = MLS + MDS                                     P    3720
      SINAL = SIN(ALFAF)                                    P    3730
      COSAL = COS(ALFAF)                                    P    3740
      LRESHC = LHC*COSAL - DHC*SINAL                        P    3750
      LRESH = LH*COSAL - DH*SINAL                           P    3760
      LRESSC = LSC*COSAL - DSC*SINAL                        P    3770
      LRESS = LS*COSAL - DS*SINAL                           P    3780
      DRESHC = DHC*COSAL + LHC*SINAL                        P    3790
      DRESH = DH*COSAL + LH*SINAL                           P    3800
      DRESSC = DSC*COSAL + LSC*SINAL                        P    3810
      DRESS = DS*COSAL + LS*SINAL                           P    3820
      RBARHC = 12.*MLHC/LHC                                 P    3830
      RBARH = 12.*MLH/LH                                    P    3840
      RBARSC = 12.*MLSC/LSC                                 P    3850
      RBARS = 12.*MLS/LS                                    P    3860
      ZBARHC = 12.*MDHC/DHC                                 P    3870
      ZBARH = 12.*MDH/DH                                    P    3880
      ZBARSC = 12.*MDSC/DSC                                 P    3890
      ZBARS = 12.*MDS/DS                                    P    3900
      FRHC = SQRT(LRESHC**2+DRESHC**2)                      P    3910
      FRH = SQRT(LRESH**2+DRESH**2)                         P    3920
      FRSC = SQRT(LRESSC**2+DRESSC**2)                      P    3930
      FRS = SQRT(LRESS**2+DRESS**2)                         P    3940
      FTC = FHC+FSC                                         P    3950
      FT = FH + FS                                          P    3960
      AFT = AFH + AFS                                       P    3970
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```
      LTC = LHC + LSC
      LT = LH + LS
      ALT = ALH + ALS
      MLTC = MLHC + MLSC
      MLT = MLH + MLS
      RBARTC = 12.*MLTC/LTC
      RBART = 12.*MLT/LT
      DTC = DHC + DSC
      DT = DH + DS
      MDTC = MDHC + MDSC
      MDT = MDH + MDS
      ZBARTC = 12.*MDTC/DTC
      ZBART = 12.*MDT/DT
      MRTC = MRESHC + MRESSC
      MRT = MRESH+MRESS
      LRTC = LTC*COSAL - DTC*SINAL
      LRT = LT*COSAL - DT*SINAL
      DRTC = DTC*COSAL + LTC*SINAL
      DRT = DT*COSAL + LT*SINAL
      FRTC = SQRT(LRTC**2+DRTC**2)
      FRT = SQRT(LRT**2+DRT**2)
      VAFTAV = G*DFLUX/WDOT
      VAFTAC = G*DFLUXC/WDOTC
      VIOVC = VINF/VC
      VIMVV = (VINF-VAFTAV)/VC
      VIMVC =(VINF-VAFTAC)/VC
      DOL = DRT/LRT
      DOLC = DRTC/LRTC
      ON8PI = 180./3.14159265
C
C     MISALIGNMENT PARAMETERS
C
      DELV = ATAN2(VAFTAV,VC)*ON8PI
      DELVC = ATAN2(VAFTAC,VC)*ON8PI
      DELM = ATAN2(DFLUX,MFLUX)*ON8PI
      DELMC = ATAN2(DFLUXC,MFLUXC)*ON8PI
      MFLXP = FRT + LT
      MFLXPC = FRTC + LTC
      DMFLX = MFLUX - MFLXP
      DMFLXC = MFLUXC - MFLXPC
      PCDMF = DMFLX/MFLUX
      PCDMFC = DMFLXC/MFLUXC
      PCD2L = (MFLUX-2.D*LRT)/MFLUX
      PCD2LC = (MFLUXC-2.D*LRTC)/MFLUXC
      LIFT = (WDOT*VC/G-FRT)*COSAL
      LIFTC = (WDOTC*VC/G-FRTC)*COSAL
      DRAGP = (WDOT/G)*(VC*SINAL+VINF)-FRT*SINAL
      DRAGPC = (WDOTC/G)*(VC*SINAL + VINF)-FRTC*SINAL
      DRAG = DRAGP-DFLUX*COSAL
      DRAGC = DRAGPC - DFLUXC*COSAL
      ALFAF=ALFAF/PIO180
      WRITE (6,165)
      WRITE (6,135)
      WRITE (6,140)FHC,FH,AFH,FSC,FS,AFS,FTC,FT,AFT
      WRITE (6,150)
      WRITE (6,145)LHC,LH,ALH,LSC,LS,ALS,LTC,LT,ALT,MLHC,MLH,MLS[illegible]
     1TC,MLT,RBARHC,RBARH,RBARSC,RBARS,RBARTC,RBART
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      WRITE (6,155)
      WRITE (6,170)DHC,DH,DSC,DS,DTC,DT,MDHC,MDH,MDSC,MDS,MDTC,MDT,ZBARH
     1C,ZBARH,ZBARSC,ZBARS,ZBARTC,ZBART
      WRITE (6,160)ALFAF,MRESHC,MRESH,MRESSC,MRESS,MRTC,MRT,LRESHC,LRESH
     1,LRESSC,LRESS,LRTC,LRT,DRESHC,DRESH,DRESSC,DRESS,DRTC,DRT,FRHC,FRH
     1,FRSC,FRS,FRTC,FRT
      WRITE (6,195)XOFF(I)
      WRITE (6,200)ARI,FRI,WDOT,MFLUX,MMFLX,DFLUX,VAFTAV,ARIXT,FRIC,WDOT
     1C,MFLUXC,MMFLXC,DFLUXC,VAFTAC
      WRITE (6,205)VIOVC,VIMVV,VIMVC,DOL,DOLC
      WRITE (6,210)DELV,DELVC,DELM,DELMC,MFLXP,DMFLX,PCDMF,PCD2L,MFLXPC,
     1DMFLXC,PCDMFC,PCD2LC
      WRITE (6,215)LIFT,LIFTC,DRAGP,DRAGPC,DRAG,DRAGC
  110 CONTINUE
  115 FORMAT (7E11.4)
  120 FORMAT (I5)
  125 FORMAT (4E11.4,2F7.5,2E11.4)
  130 FORMAT (5E15.6)
  135 FORMAT (1H0,20X,23H**********HUB**********,16X,23H*******SHROUD*
     1*******,  17X,22HTOTAL (HUB AND SHROUD)/15X,8HCOMPRESS,5X,10HINCOMP
     2PRESS,5X,4HAREA,7X,8HCOMPRESS,5X,10HINCOMPRESS,5X,4HAREA,7X,8HCOMP
     3RESS,5X,10HINCOMPRESS,5X,4HAREA )
  140 FORMAT (3X,5HTOTAL/                 3X,5HFORCE,4X,1P9E13.4/ )
  145 FORMAT (5X,5HFORCE,2X,1P9E13.4/5X,6HMOMENT,1X,1P2E13.4,13X,1P2E13.
     14,13X,1P2E13.4/5X,7HMOM.ARM,1P2E13.4,13X,1P2E13.4,13X,1P2E13.4/ )
  150 FORMAT (3X,4HLIFT )
  155 FORMAT (3X,4HDRAG )
  160 FORMAT (3X,10HRESULTANTS,10X,18HANGLE OF ATTACK = ,1PE12.5,1X,17HF
     *OR LIFT AND DRAG/          5X,6HMOMENT,1X,1P2E13.4,13X,1P2E13.4,13X,
     11P2E13.4/5X,4HLIFT,3X,1P2E13.4,13X,1P2E13.4,13X,1P2E13.4/5X,4HDRAG
     2,3X,1P2E13.4,13X,1P2E13.4,13X,1P2E13.4/5X,5HFORCE,2X,1P2E13.4,13X,
     41P2E13.4,13X,1P2E13.4)
  165 FORMAT (1H0,50X,17HSURFACE INTEGRALS/ )
  170 FORMAT (5X,5HFORCE,2X,1P2E13.4,13X,1P2E13.4,13X,1P2E13.4/
     1           5X,6HMOMENT,1X,1P2E13.4,13X,1P2E13.4,13X,1P2E13.4/
     2            5X,7HMOM.ARM, 1P2E13.4,13X,1P2E13.4,13X,1P2E13.4/ )
  175 FORMAT (1H1,9X,10HCASE   --   ,A6//10X,9HYTESTH = ,1PE12.5,3X,9HYTES
     1TS = ,1PE12.5,3X,8HYWING = ,1PE12.5//10X,9HVC      = ,1PE12.5,3X,9H
     2VINF    = ,1PE12.5,3X,8HALFAF = ,1PE12.5,2X,9HTTOTAL = ,1PE12.5//10
     3X,9HRHOT    = ,1PE12.5,3X,9HPA      = ,1PE12.5,3X,8HPAC    = ,1PE12.5
     4//10X,9HMINF    = ,1PE12.5,3X,9HMC      = ,1PE12.5///10X,9HNTHETA =
     5,I5)
  180 FORMAT (1H0,9X,9HTHETA   = ,1PE12.5//47X,13H*****HUB*****//15X,1HX,
     114X,1HY,14X,6HPSOPTC,13X,5HPSOPT,12X,1HS,12X,4HVRES,12X,2HCP/
     2(1PE22.5,1P2E16.5,1PE19.5,1P3E15.5))
  185 FORMAT(1H0,44X,16H*****SHROUD*****//15X,1HX,14X,1HY,14X,6HPSOPTC,
     313X,5HPSOPT,12X,1HS,12X,4HVRES,12X,2HCP/(1PE22.5,1P2E16.5,1PE19.5,
     21P3E15.5))
  190 FORMAT (1H0,43X,
     418H*****OFF BODY*****//10X,1HX,13X,1HY,14X,2HVX,14X,4HVAFT,11X,5HP
     4SOPC,11X,4HPSOP,12X,4HVRES,12X,2HCP//(1PE16.4,1PE13.4,1P3E16.4,1P
     5E16.4))
  195 FORMAT (1H0,35X,34HMEASURING STATION INTEGRALS    X = ,1PE12.5)
  200 FORMAT (1H0,33X,9HFORCE DUE,6X,6HWEIGHT,5X,8HMOMENTUM,6X,9HMOMENT
     1OF,9X,4HDRAG,7X,7HAVERAGE/14X,4HAREA,16X,9HTO PRESS.,7X,4HFLOW,8X,
     24HFLUX,8X,12HMOMENTUM FLX,6X,4HFLUX,8X,4HVAFT//3X,3HINT,5X,1PE12.5
     3,2X,6HINCOMP,2X,1PE11.4,1P3E13.4,1PE14.5,1PE14.4/  3X,5HEXACT,
```

```
     43X,1PE12.5,2X,4HCOMP,4X,1PE11.4,1P3E13.4,1PE14.5,1PE14.4)
 205 FORMAT (1H0,2X,11HVINF/VC   = ,1PE11.4,2X,19H(VINF-VAFTAV)/VC = ,1P
     1E11.4,2X,19H(VINF-VAFTAC)/VC = ,1PE11.4//3X,6HD/L = ,1PE11.4,3X,8H
     2DC/LC = ,1PE11.4)
 210 FORMAT (1H0,50X,23HMISALIGNMENT PARAMETERS/20X,7HDELV = ,1PE12.5,5
     1X,8HDELVC = ,1PE12.5,5X,7HDELM = ,1PE12.5,5X,8HDELMC = ,1PE12.5/
     2 1H0,56X,11HCOMPARISONS/20X,9HMFLXP   = ,1PE12.5,5X,9HDMFLX   = ,
     31PE12.5,5X,9HPCDMF   = ,1PE12.5,5X,9HPCD2L   = ,1PE12.5/
     420X,9HMFLXPC  = ,1PE12.5,5X,9HDMFLXC  = ,1PE12.5,5X,9HPCDMFC  = ,
     51PE12.5,5X,9HPCD2LC  = ,1PE12.5)
 215 FORMAT(1H0,2X,7HLIFT = ,1PE11.4,3X,8HLIFTC = ,1PE11.4,3X,8HDRAGP =
     1 ,1PE11.4,3X,9HDRAGPC = ,1PE11.4,3X,7HDRAG = ,1PE11.4,3X,8HDRAGC =
     2 ,1PE11.4)
      RETURN
      END
```

```
      SUBROUTINE INTPOL (L,J,XI,IFLAG,VX,VRES,BETA,ALPH)
C*****
C***  THIS SUBROUTINE INTERPOLATES AND DIFFERENTIATES
C*****
      COMMON /ONOUT/ VRESON(400),VP(400),BETAON(400)
      COMMON /GEABC/ YI
      COMMON /RQOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTMF
     1IN,NSPLT,YWING
      COMMON /RQOUT2/ T(400,2),VYAX(200,2),VYCR(200),V2(400),V3(400),VZCF
     1R(200)
      DIMENSION V(400), B(400)
      EPS=1.0E-6
      M=J-1
      N=J+1
      A=1.0
      DO 10 K=M,N
      XDIF=XI-XON(K)
      IF (XDIF.EQ.0.0) XDIF=EPS
      A=A*XDIF
   10 CONTINUE
C
C     IF THE REAKE X EQUALS THE ON BODY X THEN SET INTERPOLATED VALUES.
C        TO THE VALUES ON BODY
C
      IF (ABS(XI-XON(J)).LE.1.0E-6) GO TO 55
      DO 15 K=M,N
      B(K)=1.0
      DO 15 LL=M,N
      IF (LL.EQ.K) GO TO 15
      B(K)=B(K)*(XON(K)-XON(LL))
   15 CONTINUE
      YI=0.0
      DUM=0.0
      VINT=0.0
      DO 35 II=M,N
      XDIF=XI-XON(II)
      IF (XDIF.EQ.0.0) XDIF=EPS
      IF (IFLAG.GT.1) GO TO 25
      IF (L.EQ.3) GO TO 20
      V(II)=T(II,L)
      GO TO 30
   20 V(II)=V2(II)
      GO TO 30
   25 V(II)=VRESON(II)
   30 YI=YI+(A*YON(II))/(XDIF*B(II))
      VINT=VINT+(A*V(II))/(XDIF*B(II))
      IF (IFLAG.EQ.1) GO TO 35
      V(II)=VP(II)
      DUM=DUM+(A*V(II))/(XDIF*B(II))
   35 CONTINUE
      IF (IFLAG.EQ.1) GO TO 45
      BETA=0.0
      PSOP=0.0
      DO 40 II=M,N
      XDIF=XI-XON(II)
      IF (XDIF.EQ.0.0) XDIF=EPS
```

```
      BETA=BETA+(A*BETAON(II))/(XDIF+B(II))                              F   0560
   40 CONTINUE                                                           F   0570
   45 JK=J                                                               F   0580
   50 AD=XI-XON(JK-1)                                                    F   0590
      BD=XON(JK)-XI                                                      F   0600
      P0=AD*(AD+BD)                                                      F   0610
      P1=-(AD*BD)                                                        F   0620
      P2=(AD+BD)*BD                                                      F   0630
      A0=-BD                                                             F   0640
      A1=AD-BD                                                           F   0650
      A2=AD                                                              F   0660
      DY=(A0*YON(JK-1))/P0+(A1*YI)/P1+(A2*YON(JK))/P2                    F   0670
      ALPHA=ATAN(DY)                                                     F   0680
      ALPH=ALPHA/(3.14159265/180.)                                       F   0690
      VX=VINT*COS(ALPHA)                                                 F   0700
      VRES=VINT                                                          F   0710
      IF (IFLAG.EQ.2) VX=DUM*COS(ALPHA)                                  F   0720
      RETURN                                                             F   0730
   55 IF (L.EQ.3) VINT=V2(J)                                             F   0740
      VINT=T(J,L)                                                        F   0750
      IF (IFLAG.GT.1) VINT=VRESON(J)                                     F   0760
      YI=YON(J)                                                          F   0770
      IF (IFLAG.NE.1) DUM=VP(J)                                          F   0780
      BETA=BETAON(J)                                                     F   0790
      JK=J-1                                                             F   0800
      GO TO 50                                                           F   0810
      END                                                                F   0820
```

```
      SUBROUTINE LGRNGE (X,Y,ARG,GIN)
      COMMON/JAN1/ MM,LL,N
      DIMENSION   X(1), Y(50,1,20),GIN(1,20),A(10)
      EQUIVALENCE (XX,A(1)),(X0,A(2)),(X1,A(3)),(X2,A(4)),(X3,A(5)),
     1 (Y0,A(6)),(Y1, A(7)),(Y2,A(8)),(Y3,A(9))
      IF (ARG-X(2)) 10,10,15
   10 MX   = 1
      GO TO 40
   15 IF (X(N).LT.X(1).OR.ARG.LE.X(1)) GO TO 10
      IF (ARG-X(N-1)) 25,25,20
   20 MX = N-3
      GO TO 40
   25 K = N-1
      DO 35 JA=2,K
      IF (ARG-X(JA)) 30,30,35
   30 MX   = JA-2
      GO TO 40
   35 CONTINUE
   40 XX = ARG
      DO 45 I=1,4
      MXI = MX+I-1
   45 A(I+1) = X(MXI)
      B1=((XX-X1)*(XX-X2)*(XX-X3))/(X0-X1)/(X0-X2)/(X0-X3)
      B2=((XX-X0)*(XX-X2)*(XX-X3))/(X1-X0)/(X1-X2)/(X1-X3)
      B3=((XX-X0)*(XX-X1)*(XX-X3))/(X2-X0)/(X2-X1)/(X2-X3)
      B4=((XX-X0)*(XX-X1)*(XX-X2))/(X3-X0)/(X3-X1)/(X3-X2)
      DO 55 L=1,LL
      DO 55 J=1,MM
      DO 50 I=1,4
      MXI = MX+I-1
   50 A(I+5) = Y(MXI,J,L)
      ANS   = B1 * Y0 + B2 * Y1 + B3 * Y2 + B4 * Y3
   55 GIN (J,L) = ANS
      RETURN
      END
```

```
      SUBROUTINE NOEPTS
C*****
C***  THIS SUBROUTINE IS TO FIND THE END POINTS - FOR RAKES NEAR HUB,
C***     SHROUD AND/OR SPLITTERS
C***     NOS = THE NUMBER OF END POINTS FOR EACH RAKE = 2*NO. OF SPLITTEN
C***             + 2  (HUB AND SHROUD)
C***     NOEP = THE INDEX OF THE RAKE ENDPOINTS
C*****
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /NOUT/ IBEGIN(25),IEND(25),NOEP(50,6),NOS(25),NRAKES
      COMMON /RDOUT1/ XON(400),YON(400),NSPC(10),NSPB(10),XRI,NHUBMX,NTMN
     1TN,NSPLT,YWING
      J=1
      IBEGIN(1)=1
      NPMNM1=NPMIN-1
      DO 15 I=1,NPMNM1
      IF (ABS(XOFF(I+1)-XOFF(I)).GT..01) GO TO 10
      GO TO 15
   10 IEND(J)=I
      J=J+1
      IBEGIN(J)=I+1
   15 CONTINUE
      NRAKES=J
      IEND(J)=NPMIN
C*****
C***  FIND THE END POINTS OF THE SPLITTER
C*****
      DO 30 I=1,NRAKES
      IB=IBEGIN(I)
      IE=IEND(I)
      IEM1=IE-1
      DYTEST=ABS(YOFF(IB)-YOFF(IB+1))
C*****
C***  NS IS THE COUNTER TO DETERMINE NUMBER OF END POINTS PER RAKE
C***  NOEP IS THE END POINT INDEX
C*****
      NS=1
      NOEP(I,1)=IB
      IF (NSPLT.EQ.0) GO TO 25
      DO 20 K=IB,IEM1
      IF (ABS(ABS(YOFF(K+1)-YOFF(K))-DYTEST).LE.1.0E-4) GO TO 20
      NS=NS+1
      NOEP(I,NS)=K
      NS=NS+1
      NOEP(I,NS)=K+1
      DYTEST=ABS(YOFF(K+1)-YOFF(K+2))
   20 CONTINUE
   25 NS=NS+1
      NOEP(I,NS)=IE
      NOS(I)=NS
   30 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE OFFBDY
C
C     SUBROUTINE TO CALCULATE ALL OFF-BODY VARIABLES
C     CPCON  CONTAINS MACH NO. (M)  ON OUTPUT AS OF 6/12/74
C
      COMMON /MONOF/ JJS,JJ
      COMMON /ONOUT/ VRESON(400),VP(400),BETAON(400)
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON/BOP/WDOTCR
      COMMON /NOUT/ IBEGIN(25),IEND(25),NOCP(50,6),NOS(25),NRAKES
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTML
     1IN,NSPLT,YWING
      COMMON /RDOUT4/ NTHETA,THETA(10),XTEST(10)
      COMMON /GEABC/ YI
      COMMON /COUT1/ QCA,PTC,PSPTCI,PT0180,ATOTAL,GRHO
      COMMON /TOUT1/ SINTH,COSTH,OMEGA
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP
      COMMON /VOUT1/ PSOPC(100),PHII(100),ZETAI(100),VYI(100),CPC(100),VL
     1ZI(100),VMI(100),VAFTI(100),VSPANI(100),ETAI(100)
      COMMON /VOUT2/ UI(100),VZPRI(100),BETAPI(100),VPRI(100),VZPRST(100
     1),BETAPS(100),VPRST(100),MPRST(100),MPRI(100)
      COMMON/BOO/DELQ
      COMMON/FORCE/ S(400),VAFT(200),VXC(200),VRESOF(200),VRCS(100),
     1VX(100),Y(100),X(100),NRI
      DIMENSION                              BETA(100), ????(100), ALFA(1
     100)
      DIMENSION QLOC(300), IOSJ(50), Q(50), DEV1(50), QFRACT(300), YLOC(
     1300)
      DIMENSION VBRFF(200), RRRIF(200),          QSTOT(50,6)
      DIMENSION                          VYC(200),    VZC(200),
     1              PSOPTC(200),MPRIME(200),MPRIST(200),ALFAOF(200),
     2              BETAOF(200),               VSPAN(200),    ETA(200),
     3                ZETA(200),    PHI(200),      VM(200),CPCOFF(200),
     4                   U(200),VZPRIM(200),BETAPR(200),VPRIME(200),
     5                           VZPRS(200),BETPS(200), VPRIST(200)
      DIMENSION PSOPT(400)
      EQUIVALENCE (PSOPT(1),PSOPTC(1)),(PSOP(1),PSOPC(1))
      REAL MPRIME,MPRIST,MPRST,MPRI
      PI=3.14159265
      O14=1.0/1.4
      GRO44=GRHO/144.
      NTEST=0
      DO 40 I=1,NPMIN
C
C     READ FROM TAPE 3  VRESOF(I),VXC(I),VYC(I),VZC(I)
C
      READ (3) VRESOF(I),VXC(I),VYC(I),VZC(I)
      VCONA=.2*(VRESOF(I)/ATOTAL)**2
      IF (VCONA.LE.1.0) GO TO 15
      PSOPTC(I)=0.0
      MPRIME(I)=0.0
      MPRIST(I)=0.0
   10 FORMAT(1H ,11HAT PT. NO. ,I5,10H,VRESOF(= ,E12.4,31H) IS GREATER T
     1HAN VMAX. VCONA= ,E12.4)
      WRITE (6,10)I,VRESOF(I),VCONA
```

```
      GO TO 20
   15 PSOPTC(I)=(1.0-VCONA)**3.5
   20 ALFAOF(I)=ATAN2(VYC(I),VXC(I))/PIO180
      BETAOF(I)=ARSIN(VZC(I)/VRESOF(I))/PIO180
      VAFT(I)=VZC(I)*SINTH+VYC(I)*COSTH
      VSPAN(I)=VYC(I)*SINTH-VZC(I)*COSTH
      ETA(I)=ATAN2(VAFT(I),VXC(I))/PIO180
      ZETA(I)=ATAN2(VSPAN(I),VXC(I))/PIO180
      PHI(I)=ATAN2(VZC(I),VXC(I))/PIO180
      VM(I)=SQRT(VXC(I)**2+VYC(I)**2)
      CPCOFF(I)=(PSOPTC(I)-PSPTC)/(QCA/PTC)
      IF (VCONA.LT.1.) GO TO 25
      CPCOFF(I)=9999.
      GO TO 30
   25 CPCOFF(I)=VRESOF(I)/ATOTAL/SQRT(1.-VCONA)
   30 CONTINUE
C
C     IF THE OFF-BODY X IS NOT AT CONTROL STATION, SKIP FOLLOWING CALCUL
C
      IF (XOFF(I).NE.XTEST(1)) GO TO 40
      IF(NTEST.EQ.0)NTEST=I
      U(I)=OMEGA*YOFF(I)
      VZPRIM(I)=VZC(I)-U(I)
      BETAPR(I)=ATAN2(VZPRIM(I),VM(I))
      VPRIME(I)=VM(I)/COS(BETAPR(I))
      BETAPR(I)=BETAPR(I)/PIO180
      VCON=VPRIME(I)/ATOTAL
      IF (VCONA.GT.1.0) GO TO 35
      MPRIME(I)=VCON/((1.0-VCONA)**.5)
   35 VZPRS(I)=-VZC(I)-U(I)
      BETPS(I)=ATAN2(VZPRS(I),VM(I))
      VPRIST(I)=VM(I)/COS(BETPS(I))
      BETPS(I)=BETPS(I)/PIO180
      VPCON=VPRIST(I)/ATOTAL
      IF (VCONA.GT.1.0) GO TO 40
      MPRIST(I)=VPCON/((1.0-VCONA)**.5)
   40 CONTINUE
      CALL NOEPTS
C*****
C***  I = COUNT FOR INTERPOLATED OFF-BODY POINTS
C***  IK  LOOP  FOR NUMBER OF RAKES
C*****
      I=0
      DO 95 IK=1,NRAKES
      NOSI=NOS(IK)
      IB=IBEGIN(IK)
      IF(IB.EQ.NTEST)NTEST=IK
C*****
C***  IS = STARTING POINT TO FIND ON-BODY X VALUE
C***  ISP = STOPPING POINT TO FIND ON-BODY X VALUE
C***  K = COUNT FOR NUMBER OF ENDPOINTS FOR RAKE
C*****
      NS=0
      DO 90 K=1,NOSI
      IF (K.GT.1) GO TO 45
      IS=1
      ISP=NHUBMX
```

```
      GO TO 70
   45 IF (K.EQ.NOSI) GO TO 65
      IF (MOD(K,2).EQ.0) GO TO 50
      IS=NSPE(NS)
      ISP=NSPB(NS+1)-1
      IF (K.EQ.NOSI-1) ISP=NTMIN
      GO TO 70
   50 NS=NS+1
   55 IS=NSPB(NS)
      ISP=NSPE(NS)
      IF (XOFF(IB).GT.XON(IS).OR.XOFF(IB).LT.XON(ISP)) GO TO 60
      GO TO 70
   60 NS=NS+1
      GO TO 55
   65 IS=NHUBMX+1
      ISP=JJ
C
C     DO LOOP TO SEARCH FOR ON-BODY X VALUES NEAREST TO OFF-BODY X VALUE
C
   70 I=I+1
      X(I)=XOFF(IB)
      IFLAG=2
      DO 85 J=IS,ISP
      IF (MOD(K,2).EQ.0) GO TO 75
C
C     SEARCHING FORWARD - TOP-SIDE OF A BODY
C
      IF (X(I).LE.XON(IS)) GO TO 80
      IF (XON(J).LT.X(I)) GO TO 85
      CALL INTPOL (I,J,X(I),IFLAG,VX(I),VRES(I),BETA(I),ALFA(I))
      PSOPC(I)=(1.0-.2*(VRES(I)/ATOTAL)**2)**3.5
      Y(I)=YI
      CALL VAROFF (I,BETA,ALFA,VX,VRES,X,Y)
      GO TO 90
C
C     SEARCHING BACKWARD - UNDERSIDE OF A BODY
C
   75 IF (XON(J).GT.X(I)) GO TO 85
      IND=J-1
      CALL INTPOL (I,J,X(I),IFLAG,VX(I),VRES(I),BETA(I),ALFA(I))
      PSOPC(I)=(1.0-.2*(VRES(I)/ATOTAL)**2)**3.5
      Y(I)=YI
      BETA(I)=-BETA(I)
      VX(I)=-VX(I)
      CALL VAROFF (I,BETA,ALFA,VX,VRES,X,Y)
      GO TO 90
   80 Y(I)=0.0
      VX(I)=VXC(IB)
      VRES(I)=VRESOF(IB)
      BETA(I)=BETAOF(IB)
      ALFA(I)=ALFAOF(IB)
      PSOPC(I)=PSOPTC(IB)
      CPC(I)=CPCOFF(IB)
      GO TO 90
   85 CONTINUE
   90 CONTINUE
   95 CONTINUE
```

```
C******
C***  INTEGRATED WEIGHT FLOW BETWEEN LOWER BOUNDARY(EITHER HUB OR AXIS)
C***        AND LOCAL Y VALUE
C***  NIO  = NUMBER OF INTERPOLATED OFF BODY POINT
C******
      NIO=0
      IOS=0
      DO 125 J=1,NRAKES
      IOS=IOS+1
      QLOC(IOS)=0.0
      NOSI=NOS(J)
      QST=0.0
      DO 120 NS=1,NOSI,2
      NIO=NIO+1
      NLOW=NOEP(J,NS)
      NHI=NOEP(J,NS+1)
      NHIM1=NHI-1
      IOS=IOS+1
      QLOC(IOS)=PI*(PSOPTC(NLOW)**014*(YOFF(NLOW)*VXC(NLOW))+PSOPC(NIO)*
     1*014*(Y(NIO)*VX(NIO)))*(YOFF(NLOW)-Y(NIO))+QST
      DO 100 I=NLOW,NHIM1
      IOS=IOS+1
      QLOC(IOS)=QLOC(IOS-1)+PI*(PSOPTC(I+1)**014*(YOFF(I+1)*VXC(I+1))+PS
     1OPTC(I)**014*(YOFF(I)*VXC(I)))*(YOFF(I+1)-YOFF(I))
  100 CONTINUE
      NIO=NIO+1
      IOS=IOS+1
      IF (X(NIO).LT.XON(JJ)) GO TO 105
      QLOC(IOS)=QLOC(IOS-1)+PI*(PSOPC(NIO)**014*(Y(NIO)*VX(NIO))+PSOPTC(
     1NHI)**014*(YOFF(NHI)*VXC(NHI)))*(Y(NIO)-YOFF(NHI))
      QST=QLOC(IOS)
      GO TO 110
  105 QLOC(IOS)=QLOC(IOS-1)
      QST=QLOC(IOS)
  110 IF (NS.EQ.NOSI-1) GO TO 115
      IOS=IOS+1
      QLOC(IOS)=QLOC(IOS-1)
  115 QSTOT(J,NS)=QST
  120 CONTINUE
      IOSJ(J)=IOS-IOSAVE
      IOSAVE=IOS
      IF (J.EQ.1) IOSJ(J)=IOS
      Q(J)=QST
  125 CONTINUE
      DO 130 I=1,IOS
      QLOC(I)=QLOC(I)*GRO44
  130 CONTINUE
      SUM=0.0
      DO 135 I=1,NRAKES
      Q(I)=Q(I)*GRO44
      IF (IREGIN(I).NE.NCLO) GO TO 135
      QBAR=Q(I)
  135 CONTINUE
      DO 140 I=1,NRAKES
      DEVI(I)=(Q(I)-QBAR)/QBAR
  140 CONTINUE
      IST=1
```

```
      IFN=IQSJ(1)
      DO 150 I=1,NRAKES
      QALL=Q(I)
      JT=IBEGIN(I)
      IF(XOFF(JT).LT.XON(JJ))QALL=Q(NTEST)
      DO 145 J=IST,IFN
      QFRACT(J)=QLOC(J)/QALL
  145 CONTINUE
      IST=IFN+1
      IFN=IFN+IQSJ(I+1)
  150 CONTINUE
C
C     WRITE OFF-BODY DATA
C
      READ (2) (VBREF(I),RBRTF(I),I=1,NPHIN)
      WRITE (6,235)
      NIO=0
      DO 165 I=1,NRAKES
      NOSI=NOS(I)
      DO 160 NS=1,NOSI,2
      NLOW=NOEP(I,NS)
      NHI=NOEP(I,NS+1)
  155 NIO=NIO+1
      WRITE (6,240)X(NIO),Y(NIO),VX(NIO),VYI(NIO),VZI(NIO),VRES(NIO),VMI(
     1(NIO),VAFTI(NIO),VSPANI(NIO),PSOPC(NIO)
      IF (MOD(NIO,2).EQ.0) GO TO 160
      WRITE (6,245)(J,XOFF(J),YOFF(J),VXC(J),VYC(J),VZC(J),VRESOF(J),VM(
     1J),VAFT(J),VSPAN(J),RBRTF(J),PSOPTC(J),J=NLOW,NHI)
      GO TO 155
  160 CONTINUE
  165 CONTINUE
      WRITE (6,250)
      NIO=0
      NQ=0
      DO 185 I=1,NRAKES
      NOSI=NOS(I)
      DO 180 NS=1,NOSI,2
      NLOW=NOEP(I,NS)
      NHI=NOEP(I,NS+1)
  170 NIO=NIO+1
      NQ=NQ+1
      YLOC(NQ) = Y(NIO)
      WRITE (6,255)X(NIO),Y(NIO),CPC(NIO),ALFA(NIO),BETA(NIO),ETAI(NIO),
     1ZETAI(NIO),PHII(NIO),QFRACT(NQ)
      IF (MOD(NIO,2).EQ.0) GO TO 180
      DO 175 J=NLOW,NHI
      NQ=NQ+1
      YLOC(NQ) = YOFF(J)
      WRITE (6,260)J,XOFF(J),YOFF(J),VBREF(J),CPCOFF(J),ALFAOF(J),BETAOF
     1(J),ETA(J),ZETA(J),PHI(J),QFRACT(NQ)
  175 CONTINUE
      GO TO 170
  180 CONTINUE
  185 CONTINUE
C
C     WRITE OFF-BODY DATA AT THE CONTROL STATION
C
```

```
      WRITE (6,265)XTEST(I),UTIP
      NIO=0
      DO 205 I=1,NRAKES
      NOSI=NOS(I)
      DO 200 NS=1,NOSI,2
      NLOW=NOEP(I,NS)
      NHI=NOEP(I,NS+1)
  190 NIO=NIO+1
      IF (X(NIO).NE.XTEST(I)) GO TO 195
      WRITE (6,270)Y(NIO),UI(NIO),VZPRI(NIO),VPRI(NIO),MPRI(NIO),BETAPI(
     1NIO),VZPRST(NIO),VPRST(NIO),MPRST(NIO),BETAPS(NIO)
      IF (MOD(NIO,2).EQ.0) GO TO 200
      NPI=NIO
      WRITE (6,270)(YOFF(J),U(J),VZPRIM(J),VPRIME(J),MPRIME(J),BETAPR(J)
     1,VZPRS(J),VPRIST(J),MPRIST(J),BETPS(J),J=NLOW,NHI)
      GO TO 190
  195 NIO=NIO+1
  200 CONTINUE
  205 CONTINUE
C
C     WRITE WEIGHT FLOW DATA
C
      WRITE (6,285)
      NIO=0
      DO 230 I=1,NRAKES
      NOSI=NOS(I)
      DO 225 J=1,NOSI,2
      NIO=NIO+2
      QSTOT(I,J)=QSTOT(I,J)*GRO44
      QFR=QSTOT(I,J)/Q(I)
      EM=99999.
      QWALL=99999.
      FLCOEF=99999.
      WDOCRA=99999.
      IF (X(NIO).LE.XON(JJ)) GO TO 215
      ARAKE=PI/144.*(Y(NIO)*Y(NIO)-Y(NIO-1)*Y(NIO-1))
      QWALL=GRHO*ARAKE*PSOPC(NIO)**014*VX(NIO)
      FLCOEF=QSTOT(I,J)/QWALL
      EM=0.
      WDOCRA=QSTOT(I,J)*SQRT(TTOTAL/518.67)/PTC*2116.22/ARAKE
  210 EF=85.3848*EM/(1.+.2*EM*EM)**3.-WDOCRA
      DFDM=85.3848/(1.+.2*EM*EM)**3.*(1.-1.2*EM*EM/(1.+.2*EM*EM))
      EM=EM-EF/DFDM
      IF (ABS(EF/DFDM/(EM+EF/DFDM)).GE..01) GO TO 210
  215 IF (J.GT.1) GO TO 220
      IF (X(NIO).GT.XON(JJ)) WRITE (6,275)I,X(NIO),DEV1(I),QSTOT(I,J),QF
     2R,WDOCRA,EM,QWALL,FLCOEF
      IF (X(NIO).LE.XON(JJ)) WRITE (6,275)I,X(NIO),DEV1(I),QSTOT(I,J),QF
     2R
      GO TO 225
  220 IF (X(NIO).GT.XON(JJ)) WRITE (6,280)QSTOT(I,J),QFR,WDOCRA,EM,QWALL
     2,FLCOEF
      IF (X(NIO).LE.XON(JJ)) WRITE (6,280)QSTOT(I,J),QFR
  225 CONTINUE
  230 CONTINUE
      CALL STRML(YLOC,QFRACT,IOSJ,NRAKES,XOFF,NOEP)
      IF(NX.EQ.-1) CALL OFFORC(PSOPTC,PSOPT)
```

```
      RETURN
C*****
C***        FORMATS
C*****
C
  235 FORMAT (1H1,5X,23HOFF-BODY POINTS (RAKES)/
     *       1H0,10X,116HCOORDINATES        *---------------------------
     1------VELOCITIES---------------------------------------*  PRESS.R
     2ATIO/123H    AXIAL       RADIAL       AXIAL         RADIAL    CIRCUMF
     3ENTL  RESULTANT  MERIDIONAL . CHORDWISE   SPANWISE              COMP
     4/129H   I       X              Y              VX              VY            VZ
     5          VRES            VM            VAFT         VSPAN     RHOUR    PSOP
     6TC)
  240 FORMAT (5X,1P9E12.4,7X,0PF8.4)
  245 FORMAT (I5,1P9E12.4,0PF7.4,0PF8.4)
  250 FORMAT (//1H0,112H                    COORDINATES                 NEW  CP
     1      *-------------------------ANGLES--------------------------*/1
     2E9H              AXIAL       RADIAL                                MERIDIONAL
     3L       FLOW       UNDERTURNG    SPANWISE      SWIRL/122H   I        X
     4            Y             VBR1             M              ALPHA          BETA
     5ETA            ZETA            PHI           QFRACT)
  255 FORMAT (5X,1P2E12.4,12X,1P7E12.4)
  260 FORMAT (I5,1P10E12.4)
  265 FORMAT (1H1 5X,25HRELATIVE ROTOR INLET DATA/
     *           1H0,14H              X = ,F10.4,17H           UTIP = ,F10.4//12
     12H            Y              U           VZPRIME        VPRIM        MPRIME
     2     BETAPR          VZPRST         VPRST          MPRS          BETAPS)
  270 FORMAT (5X,1P10E12.4)
  275 FORMAT (I8,2X,1PE11.4,5X,1PE11.4,6X,1PE11.4,2X,1PE11.4,4X,1PE11.4,
     44X,1PE11.4,2(3X,1PE11.4))
  280 FORMAT (43X,1PE11.4,2X,1PE11.4,4X,1PE11.4,4X,1PE11.4,2(3X,1PE11.4)
     1)
  285 FORMAT (1H1,5X,21HRAKE WEIGHT FLOW DATA/
     *           1H0,92H          I           X          (Q(I)-QBAR)/QBAR          QS TOT
     1            QFR          QSTOTCR/ARAKE          MBAR
     234H                QWALL          QSTOT/QWALL )
      END
```

```
      SUBROUTINE ONBODY
C******
C**** THIS SUBROUTINE CALCULATES ON-BODY VARIABLES
C******
      DIMENSION SPLOT(400,2),PPLOT(400,2),LAB(3)
      DIMENSION PSOPT(400)
      COMMON /WRT/ KSKIP,NT(2),NP(2)
      COMMON/SLNND/SLND
      COMMON /MONOF/ JJS,JJ
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHUBMX,NTMI
     1N,NSPLT,YWING
      COMMON /COUT1/ QCA,PTC,PSPTCI,PIO180,ATOTAL,GRHO
      COMMON /ONOUT/ VRESON(400),VP(400),BETAON(400)
      COMMON /RCONT2/ PSTAT,ISTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP
      COMMON /RDOUT4/ NTHETA,THETA(10),YTEST(10),NANGLE,
     1                                     ISWIRL,TSWIRL(400)
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT,CUTOFF
      COMMON/FLAGS/IVORT,IGEOM,ISIG,ICURV,NONEWF,IDENT
      COMMON/TITL/ TTITL(9,6)
      COMMON/BICT/TITLE(12)
      DIMENSION VTH(400), PSOPTC(400), CPCON(400), VBAR(400), RBORT(400)
      COMMON/FORCE/ S(400),VAFT(200),VXC(200),VRESOF(200),VRES(100),
     1VX(100),Y(100),X(100),NRI
      EQUIVALENCE (PSOPT(1),PSOPTC(1))
      DATA SOSREF/'S/SREF'/
      DATA THHETA/6HTHETA=/
      DATA ((TTITL(I5,I6),I5=1,9),I6=1,2)
     1     /6H      ,6H   NOR,6HMALIZE,6HD SURF,6HACE DI,6HSTANCE,
     16H ON SH,6HROUD, ,6HS/SREF,6H      ,6H      ,6H PRESS, 6HSURE R,6HI
     2ATIO, , 6HPS/PTC,3*6H      /
      DATA LAB/6HTOWARD,6H FAN F,6HACE   /,SSREFF/6HSREF= /
      DO 10 IRIB=1,9
   10 TTITL(IRIB,5)=TITLE(IRIB+2)
      IPLOT1=999
      ISW=1
      IPLOT=0
      IF(NTHETA.EQ.0)      CUTOFF=0.
      IF(NTHETA.NE.0)
     1CALL SRTNE (XON,YON,XRI,YRIHUB,YRISHR,NHUBMX,NTMIN,S)
      DO 55 I=1,NTMIN
C******
C**** READ FROM TAPE 3   VRESON  ,  VP  ,  VTH
C******
      READ (3) VRESON(I),VP(I),VTH(I)
      VCONC=.2*(VRESON(I)/ATOTAL)**2
      IF (VCONC.GT.1.0) GO TO 15
      PSOPTC(I)=(1.0-VCONC)**3.5
      GO TO 25
   15 PSOPTC(I)=0.0
      WRITE (6,20)I,VRESON(I),VCONC
   20 FORMAT(1H ,11HAT PT. NO. ,I5,10H,VRESON(= ,E12.4,31H) IS GREATER T
     1HAN VMAX. VCONC= ,E12.4)
   25 IF (VTH(I).EQ.0.0) GO TO 30
      BETAON(I)=ATAN(VTH(I)/VP(I))/PIO180
      GO TO 35
   30 BETAON(I)=0.0
```

```
   35 CPCON(I)=(PSOPTC(I)-PSPTCI)/(QCA/PTC)
      IF (VCONC.LT.1.) GO TO 40
      CPCON(I)=9999.
      GO TO 55
   40 CPCON(I)=VRESON(I)/ATOTAL/SQRT(1.-VCONC)
      IF (CPCON(I).LT.1..OR.NX.NE.1) GO TO 55
      IF (CPCON(I-1).LT.1.) GO TO 45
      VSAVE1=VRESON(I)
      VRESON(I)=VRESON(I-1)+(VRESON(I)-VSAVE)*SQRT(1.+(1.-.25*(EMSAVE+CP
     1CON(I))**2)/(.25*(EMSAVE+CPCON(I))**2))
      VSAVE=VSAVE1
      EMSAVE=CPCON(I)
      VCONC=.2*(VRESON(I)/ATOTAL)**2
      PSOPTC(I)=(1.0-VCONC)**3.5
      CPCON(I)=VRESON(I)/ATOTAL/SQRT(1.-VCONC)
      GO TO 55
   45 WRITE (6,50)I
   50 FORMAT(49HCONBODY SUPERSONIC VELOCITY CORRECTION START, I= ,I4/)
      VMAC1=ATOTAL/SQRT(1.2)
      EMSAVE=CPCON(I)
      VSAVE=VRESON(I)
      VRESON(I)=VMAC1+(VRESON(I)-VMAC1)*SQRT(1.+(1.-.25*(CPCON(I)+1.)**2
     1)/(.25*(CPCON(I)+1.)**2))
      VCONC=.2*(VRESON(I)/ATOTAL)**2
      PSOPTC(I)=(1.0-VCONC)**3.5
      CPCON(I)=VRESON(I)/ATOTAL/SQRT(1.-VCONC)
   55 IF (CPCON(I).LT.1..AND.CPCON(I-1).GE.1..AND.NX.EQ.1) WRITE (6,60)I
   60 FORMAT(19H0O.S.V.C. STOP, I= ,I4/)
      READ (2) (VBAR(I),RBORT(I),I=1,NTMIN)
C*****
C***  WRITE HUB COORDINATES AND VARIABLES
C*****
      WRITE (6,115)
      IF (NHUBMX.EQ.0) GO TO 70
      WRITE (6,120)
      DO 65 I=1,NHUBMX
      XDUM=YON(I)/ELND
      YDUM=YON(I)/ELND
      SDUM=S(I)/SLND
      WRITE (6,125)I,XDUM,YDUM,VP(I),VTH(I),VRESON(I),VBAR(I),BLTAON(I),
     1SDUM,CPCON(I),RBORT(I),PSOPTC(I)
   65 CONTINUE
C*****
C***  WRITE SHROUD COORDINATES AND VARIABLES
C*****
   70 WRITE (6,130)
      WRITE (6,120)
      NHUBP1=NHUBMX+1
      DO 90 I=NHUBP1,JJS
      XDUM=YON(I)/ELND
      YDUM=YON(I)/ELND
      SDUM=S(I)/SLND
      FANTOM=VBAR(I)
      IF(NTHETA.EQ.0.AND.I.GE.ISWIRL) FANTOM=TSWIRL(I)
      IF (NTHETA.EQ.0.AND.I.EQ.ISWIRL) WRITE (6,75)
   75 FORMAT(26H0 FOLLOWING 3-D STREAMLINE/68X,'-THETA-'/)
      IF (CUTOFF.LE.0.) GO TO 85
```

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      IF (S(I)*S(I-1).GE.0.) GO TO 80
      ISW=ISW+1
      IPLOT1=IPLOT
      IPLOT=0
   80 STEST=ABS(SDUM)
      IF (STEST.GT.(CUTOFF/SLND)) GO TO 85
      IPLOT=IPLOT+1
      SPLOT(IPLOT,ISW)=STEST
      PPLOT(IPLOT,ISW)=PSOPTC(I)
   85 WRITE (6,125)I,XDUM,YDUM,VP(I),VTH(I),VRESON(I),FANTOM,BETAON(I),S
     1DUM,CPCON(I),RBORT(I),PSOPTC(I)
   90 CONTINUE
      IF (CUTOFF.LE.0.) GO TO 95
      XLEN=IFIX(10.*CUTOFF/SLND)+1.
      CALL PLOXIS(XLEN,10.,.1,.1,0.,0.,.15,.1,0,0,5,2,1,1)
      CALL SYMBOL(XLEN-1.5,.5,.25,IDENT,0.,6)
      CALL SYMBOL(XLEN-2.5,3.5,.25,THHETA,0.,6)
      THE=THETA(NANGLE)*180./3.14157
      CALL NUMBER(XLEN-1.25,3.5,.25,THE,          0.,0)
      CALL SYMBOL(XLEN-3.5,2.6,.15,1,0.,-1)
      FLD(0,6,I3)=3
      CALL SYMBOL(XLEN-3.,2.5,.25,I3,0., 1)
      CALL SYMBOL(XLEN-2.7,2.5,.25,LAB,0.,18)
      CALL SYMBOL(XLEN-2.5,1.5,.25,SSREFF,0.,6)
      CALL NUMBER(XLEN-1.25,1.5,.25,SLND,0.,2)
      CALL SYMBOL(XLEN/2.,.5,.15,SOSREF,0.,6)
      IF(IPLOT1.EQ.999)IPLOT1=IPLOT
      CALL LINE(SPLOT(1,1),PPLOT(1,1),IPLOT1,1,1,1,0.,.1,0.,.1)
      CALL LINE(SPLOT(1,2),PPLOT(1,2),IPLOT, 1,1,2,0.,.1,0.,.1)
      CALL PLOT(XLEN+1.,0.,-3)
C
C     WRITE SPLITTER COORDINATES AND VARIABLES IF IT APPLIES
C
   95 IF (NSPLT.EQ.0) GO TO 110
      DO 105 IN=1,NSPLT
      NB=NSPB(IN)
      NE=NSPB(IN+1)-1
      IF (IN.EQ.NSPLT) NE=NTMIN
      WRITE (6,135)IN
      WRITE (6,120)
      DO 100 I=NB,NE
      XDUM=XON(I)/ELND
      YDUM=YON(I)/ELND
      SDUM=S(I)/SLND
      WRITE (6,125)I,XDUM,YDUM,VP(I),VTH(I),VRESON(I),VBAR(I),BETAON(I),
     1SDUM,CPCON(I),RBORT(I),PSOPTC(I)
  100 CONTINUE
  105 CONTINUE
  110 CONTINUE
      IF(NX.EQ.-1) CALL BEFORC(PSOPTC,PSOPT)
      RETURN
C*****
C***    FORMATS
C*****
C
  115 FORMAT (1H0,10X,3HHUB)
  120 FORMAT (11X,14HON-BODY POINTS//2X,1HI,6X,1HX,11X,1HY,11X,2HVP,9X,6
```

```
     1HVTHETA,7X,4HVRES,7X,5HVBARI,7X,4HBETA,10X,1HS,11X,1HM  ,5X,5HRB/RI
     2I,3X,6HPSOPTC)                                                 I
 125 FORMAT (I4,9E12.4,F7.4,F8.4)                                    I
 130 FORMAT (1H0,10X,6HSHROUD)                                       I
 135 FORMAT (1H0,10X,8HSPLITTER,I3)                                  I
     END                                                             I
```

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```
      SUBROUTINE ONOFF                                                  H   0000
      CALL ONBODY                                                       H   0010
      CALL OFFBDY                                                       H   0020
      RETURN                                                            H   0030
      END                                                               H   0040
```

```
EODF-FARREL*SOREL2(1).CSPLOX
      SUBROUTINE PLOXIS(XX,YY,EXEP,ORD,OFSETA,OFSET,SLETRS,SNOSZ,K5,K6,K
     1,L,NK,NL)
C
C$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
C$$$$$$   SUBROUTINE ADDED TO DRAW AND LABEL AXIS FRAMES FOR ALL PLOTS $
      COMMON/TITL/ TTITL(9,6)
      UP =11.-YY-2.*SNOSZ
      M1=XX
      M2=YY
      CALL PLOT(4.,-11.,-3)
      CALL PLOT(0.,UP,-3)
      DO 25 I=1,M1
      X=I
      P=EXEP*X +OFSETA
      CALL PLOT(X,0.,2)
      CALL PLOT(X, .2,2)
      M=I/2
      B=FLOAT(I)-FLOAT(M)-X/2.
      IF (B) 10,10,25
   10 IF (K5) 15,15,20
   15 CALL NUMBER(X-SNOSZ,-SNOSZ-.10,SNOSZ,P,0.,NK)
      GO TO 25
   20 SN = 1.333*SNOSZ
      CALL NUMBER(X-SNOSZ-SNOSZ,-SN-SNOSZ-.10,SN,10.,0.,-1)
      CALL NUMBER(999.0,-SNOSZ -.10,SNOSZ,P,0.,NK)
   25 CALL PLOT(X,0.,3)
      B = (XX-54.*SLETRS)/2.
      CALL SYMBOL(B,-SNOSZ-SLETRS-.30   ,SLETRS,TTITL(1,K),0.,54)
      CALL PLOT(0.,0.,3)
      DO 45 J=1,M2
      Y=J
      O=ORD*Y+OFSET
      CALL PLOT(0.,Y,2)
      CALL PLOT(.2,Y,2)
      N=J/2
      B=FLOAT(J)-FLOAT(N)-Y/2.
      IF (B) 30,30,45
   30 IF (K6) 35,35,40
   35 CALL NUMBER(-4.*SNOSZ          -.15,Y,SNOSZ,O,0.,NL)
      GO TO 45
   40 SN = 1.333*SNOSZ
      CALL NUMBER(-.15 -SN-SN-SN    ,Y-SNOSZ,SN,10.,0.,-1)
      CALL NUMBER(999.0,Y+SN-SNOSZ,SNOSZ,0,0.,NL)
   45 CALL PLOT(0.,Y,3)
      C = (YY-54.*SLETRS)/2.
      CALL SYMBOL(-SNOSZ-SNOSZ-SNOSZ-.15-.6,C,SLETRS,TTITL(1,L),90.,54)
      CALL PLOT(0.,YY,3)
      CALL PLOT(XX,YY,2)
      CALL PLOT(XX,0.,2)
      DO 50 J=1,M2,2
      Y=J
      IF (Y.EQ.YY) GO TO 55
      CALL PLOT(XX,Y,3)
      CALL PLOT(0.,Y,2)
      IF ((Y+1.).EQ.YY) GO TO 55
      CALL PLOT(0.,Y+1.,3)
```

```
   50 CALL PLOT(XX,Y+1.,2)
   55 CONTINUE
      DO 60 J=1,MI,2
      X=J
      IF (X.EQ.XX) GO TO 65
      CALL PLOT(XX-X,YY,3)
      CALL PLOT(XX-X,C.,2)
      IF ((XX-X-1.).EQ.0.) GO TO 65
      CALL PLOT(XX-X-1.,0.,3)
   60 CALL PLOT(XX-X-1.,YY,2)
   65 RETURN
      END

@BRKPT PRINT$
```

```
      SUBROUTINE READS                                                  B   0000
C*****                                                                  B   0010
C***  THIS SUBROUTINE READS ALL INPUT                                   B   0020
C*****                                                                  B   0030
C     CPCON  CONTAINS MACH NO. (M)  ON OUTPUT AS OF 6/12/74             B   0040
C                                                                       B   0050
      EQUIVALENCE (T,TRD), (VXAX,VXAXRD), (VYAX,VYAXRD)                 B   0060
      DIMENSION TRD(1), VXAXRD(1), VYAXRD(1), EODD(400)                 B   0070
      COMMON /RSAVE/ XDUM(400),YDUM(400),XAFF(200),YAFF(200)            B   0080
     1 ,MO,JA,IR,NRUNNO,MO2,JA2,IR2,NRUNO2                              B   0090
      COMMON/FLAGS/IVORT,IGEOM,ISIG,ICURV,NONEWF,IDENT                  B   0100
      COMMON /NTN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI                  B   0110
      COMMON /RDOUT1/ XON(400),YON(400),NSPE(10),NSPB(10),XRI,NHURMX,NTMB   0120
     1IN,NSPLT,YWING                                                    B   0130
      COMMON /WRI/ KSKIP,NT(2),NP(2)                                    B   0140
      COMMON/SLNND/SLND                                                 B   0150
      COMMON /RDOUT2/ T(400,2),VYAX(200,2),VYCR(200),V2(400),V3(400),VZCB   0160
     1R(200)                                                            B   0170
      COMMON /RDOUT3/ VXAX(200,2),VXCR(200)                             B   0180
      COMMON /RDOUT4/ NTHETA,THETA(10),XTEST(10),N,ISWIRL,TSWIRL(400)   B   0190
      COMMON/TITL/ TTITL(9,6)                                           B   0200
      COMMON/RIGT/TITLE(12)                                             B   0210
      COMMON /RCONT1/ VC,VINF,ALFAF,TTOTAL,ELND,VA,PT,CUTOFF            B   0220
      COMMON /RCONT2/ PSTAT,TSTAT,WDOT,NX,KND,YRIHUB,YRISHR,UTIP        B   0230
      COMMON/CNTRYL/ YTESTH,YTESTS,NOTHET,ICTLPT,VCP,VCPBAR,RHOCCP       B   0240
      COMMON/BOO/DELO                                                   B   0250
      COMMON /MONOF/ JJS,JJ                                             B   0260
      COMMON /DSEE3D/ RANG(400,10),REX(400,10),IPLOT(10),ICASE          B   0270
C*****                                                                  B   0280
C     READ NT(1) = NUMBER OF ON-BODY POINTS FOR CLOSED BODY SOLUTION    B   0290
C              NT(2) = NUMBER OF ON-BODY POINTS FOR OPEN-END SOLUTION   B   0300
C              NP(1) = NP(2) =  TOTAL NUMBER OF OFF-BODY POINTS         B   0310
C              NID   = NUMBER OF EOD I.D. CARDS                         B   0320
C              KSKIP = 0  FOR 1 CASE OF COMBYN                          B   0330
C                    = 1  FOR SUCCESSIVE CASES USING THE SAME EOD OUTPUT B  0340
C              N4SOL = 0  THREE (3) SOLUTIONS FROM EOD                  B   0350
C                          ( 2 FOR STREAMLINES ,1 FOR CROSSFLOW )       B   0360
C                    = 1  FOUR (4) SOLUTIONS FROM EOD                   B   0370
C                          ( 2 FOR STREAMLINES, 2 FOR CROSSFLOW )       B   0380
C              NSPLT = NUMBER OF SPLITTERS (NOISE SUPPRESSION DEVICES ) B   0390
C                                                                       B   0400
C                                                                       B   0410
C              NSPB =  RIGHT MOST POINT ON THE SPLITTER                 B   0420
C              NSPE =  LEFT MOST POINT ON THE SPLITTER                  B   0430
C                                                                       B   0440
C              *****   THE FIRST SPLITTER IS THE ONE CLOSEST TO THE HUB B   0450
C                       AND THE LAST SPLITTER IS THE ONE CLOSEST TO THE SHROB   0460
C                                                                       B   0470
C*****                                                                  B   0480
      DATA  ((TTITL(I5,I6),I5=1,9),I6=3,4)                              B   0490
     A          /'      ','      ','AXIAL ','POSITI','ON ON ','SHROUD','B   0500
     1, IN. ','      ','      ','      ','      ','MERIDI','AN ANG','LE,B   0510
     2 TH','ETA, D','EG.   ','      ','      '/                         B   0520
      SLND=1.                                                           B   0530
      REWIND 7                                                          B   0540
      READ (5,165,END=105)TITLE                                         B   0550
```

```
      WRITE (6,166)TITLE
      READ (5,170)(NT(I),NP(I),I=1,2),NID,KSKIP,N4SOL,NSPLT
      WRITE (6,171)(NT(I),NP(I),I=1,2),NID,KSKIP,N4SOL,NSPLT
      NPMIN=NP(1)
      NTMIN=NT(2)
      IF (NSPLT.NE.0) READ (5,170)(NSPB(I),NSPE(I),I=1,NSPLT)
      READ (5,175)VC,VINF,ALFAF,TTOTAL,ELND,YWING,UTIP,VA,PT,CUTOFF
      WRITE (6,176)VC,VINF,ALFAF,TTOTAL,ELND,YWING,UTIP,VA,PT,CUTOFF
      IF(ELND.EQ.0.)ELND=1.
      CUTOFF=ABS(CUTOFF)
      READ (5,175)PSTAT,TSTAT,WDOT,DELQ
      WRITE (6,176)PSTAT,TSTAT,WDOT,DELQ
      READ (5,170)NTHETA,NCLO,NCHI,NX,KND,NOTHET,ICTLPT,ISWIRL
      WRITE (6,171)NTHETA,NCLO,NCHI,NX,KND,NOTHET,ICTLPT,ISWIRL
      IF(CUTOFF.GT.0..OR.(NTHETA+ICASE).EQ.2) CALL PLOTID
      IF(NTHETA.EQ.0)NOTHET=1
      READ (5,175)(THETA(I),I=1,NTHETA)
      WRITE (6,176)(THETA(I),I=1,NTHETA)
      READ (5,180)(XTEST(I),I=1,NX),YTESTH,YTESTS
      WRITE (6,180)(XTEST(I),I=1,NX),YTESTH,YTESTS
      READ (5,180)XRI,YRIHUB,YRISHR,NHUBMX
      WRITE (6,181)XRI,YRIHUB,YRISHR,NHUBMX
C*****
C***   IF KSKIP = 0 , READ DATA PUNCHED FROM EOD
C*****
      IF (KSKIP.NE.0) GO TO 75
      READ (7,10)IDENT,IVORT,IGEOM,ISIG,ICURV,NONEWF
   10 FORMAT(A6,5I1)
      IF(IVORT.EQ.1) NT(1)=NT(2)
      IF(IVORT.EQ.1) NP(1)=NP(2)
      DO 70 L=1,2
      IF (IVORT+L.EQ.3) GO TO 70
      ILOON=1+400*(L-1)
      IHION=ILOON+NT(L)-1
      NTL=NT(L)
      ILO=1+200*(L-1)
      IHI=ILO+NP(L)-1
      NPL=NP(L)
      IF (L.EQ.1) GO TO 20
      READ (7,10)IDENT,IVORT,IGEOM,ISIG,ICURV,NONEWF
C*****
C***  READ OUTPUT FROM EOD   (BINARY RECORDS)
C*****
   15 FORMAT(4E13.8)
   20 READ (7,15)(XON(JK),JK=1,NTL)
      READ (7,15)(YON(JK),JK=1,NTL)
      READ (7,15)(TRD(JK),JK=ILOON,IHION)
      NTLP4=NTL+400
      IF (IVORT.EQ.1) READ (7,15)(TRD(JK),JK=401,NTLP4)
      IF (NHUBMX+NSPLT.EQ.0) GO TO 25
      IF (IVORT.EQ.1) READ (7,15)(TRD(JK),JK=401,NTLP4)
   25 READ (7,15)(XOFF(JK),JK=1,NPL)
      READ (7,15)(YOFF(JK),JK=1,NPL)
      READ (7,15)(VXAXRD(JK),JK=ILO,IHI)
      NPLP2=NPL+200
      IF (IVORT.EQ.1) READ (7,15)(VXAXRD(JK),JK=201,NPLP2)
      IF (NHUBMX+NSPLT.EQ.0) GO TO 30
```

```
      IF (IVORT.EQ.1) READ (7,15)(VXAXRD(JK),JK=201,NPLP2)
   30 READ (7,15)(VYAXRD(JK),JK=ILO,IHI)
      IF (IVORT.EQ.1) READ (7,15)(VYAXRD(JK),JK=201,NPLP2)
      IF (NHUPMX+NSPLT.EQ.0) GO TO 35
      IF (IVORT.EQ.1) READ (7,15)(VYAXRD(JK),JK=201,NPLP2)
   35 IF (L.EQ.2) GO TO 40
      READ (7,15)(V2(JK),JK=ILOON,IHION)
      READ (7,15)(VZ(JK),JK=ILOON,IHION)
      READ (7,15)(VXCR(JK),JK=ILO,IHI)
      READ (7,15)(VYCR(JK),JK=ILO,IHI)
      READ (7,15)(VZCR(JK),JK=ILO,IHI)
      GO TO 55
   40 IF (NASOL.EQ.0) GO TO 70
      DO 45 I=1,4
      READ (7,15)(CODD(JK),JK=1,NTL)
   45 CONTINUE
      DO 50 I=1,5
      READ (7,15)(CODD(JK),JK=1,NPL)
   50 CONTINUE
   55 DO 60 I=1,NTL
      XDUM(I)=XON(I)
   60 YDUM(I)=YON(I)
      DO 65 I=1,NPL
      XAFF(I)=XOFF(I)
   65 YAFF(I)=YOFF(I)
   70 CONTINUE
   75 WRITE (6,160)TITLE
      IF(IVORT.EQ.1) NT(1)=NT(2)
      WRITE (6,80)IDENT
   80 FORMAT(1H ,22HINLET GEOMETRY IDENT= ,A6)
      IF (IVORT.EQ.1) WRITE (6,85)
   85 FORMAT(1H ,10X, 89HLINEAR COMBINATION OF THE FOLLOWING BASIC FLOWS
     1      A.  UNIFORM AXISYMMETRIC (DUCT OPEN)/64X,26HB.  STRIP VORTEX
     2 ON SHROUD/64X,33HC.  UNIFORM CROSSFLOW (DUCT OPEN))
      IF (IVORT.EQ.0) WRITE (6,90)
   90 FORMAT(1H ,10X, 91HLINEAR COMBINATION OF THE FOLLOWING BASIC FLOWS
     1      A.  UNIFORM AXISYMMETRIC (DUCT CLOSED)/64X,36HB.  UNIFORM AX
     2ISYMMETRIC (DUCT OPEN)/64X,35HC.  UNIFORM CROSSFLOW (DUCT CLOSED))
      IF (IGEOM.EQ.0) WRITE (6,95)IGEOM
      IF (IGEOM.NE.0) WRITE (6,100)IGEOM
      IF (ISIG.EQ.0) WRITE (6,105)ISIG
      IF (ISIG.EQ.1) WRITE (6,110)ISIG
      IF (ISIG.GE.2) WRITE (6,115)ISIG
      IF (ICURV.EQ.0) WRITE (6,120)ICURV
      IF (ICURV.NE.0) WRITE (6,125)ICURV
      IF (NONEWF.EQ.0) WRITE (6,130)
      IF (NONEWF.EQ.1) WRITE (6,135)
   95 FORMAT(24H0CURVED ELEMENTS(IGEOMF=,I1,1H) )
  100 FORMAT(22H0FLAT ELEMENTS(IGEOMF=,I1,1H) )
  105 FORMAT(1H+,30X,43HPIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=,I1,
     1 1H) )
  110 FORMAT(1H+,30X,40HPIECEWISE-LINEAR SOURCE DENSITIES(ISIGF=,I1,1H))
  115 FORMAT(1H+,30X,42HPIECEWISE-CONSTANT SOURCE DENSITIES(ISIGF=,I1,
     1 1H) )
  120 FORMAT(1H+,80X,46HINTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=,
     1 I1,1H) )
  125 FORMAT(1H+,80X,37HUSER-INPUT ELEMENT CURVATURES(ICURVN=,I1,1H) )
```

```
  130 FORMAT(32H NEW VELOCITY FORMULAE ARE USED. )                    B   1700
  135 FORMAT(32H OLD VELOCITY FORMULAE ARE USED. )                    B   1710
      IF(KND.EQ.8.OR.CUTOFF.GT.0.)SLND=ELND                           B   1720
      IF(KND.LT.8.AND.KND.NE.0)SLND=1.                                B   1730
      CALL CONST                                                      B   1740
      IF (KND.GE.8) GO TO 155                                         B   1750
      DO 140 I=1,NTMIN                                                B   1760
      XON(I)=YDUM(I)/ELND                                             B   1770
  140 YON(I)=YDUM(I)/ELND                                             B   1780
      DO 145 I=1,NPMIN                                                B   1790
      XOFF(I)=XAFF(I)/ELND                                            B   1800
  145 YOFF(I)=YAFF(I)/ELND                                            B   1810
      DO 150 I=1,NX                                                   B   1820
  150 XTEST(I)=XTEST(I)/ELND                                          B   1830
      CUTOFF=CUTOFF/ELND                                              B   1840
  155 IF(KND.NE.9)ELND=1.                                             B   1850
      RETURN                                                          B   1860
C                                                                     B   1870
C     FORMATS                                                         B   1880
C                                                                     B   1890
C                                                                     B   1900
  160 FORMAT (1H1,10X,30HCOMPRESSIBLE COMBYN APPROACH 5,10X,12A6)     B   1910
  165 FORMAT (12A6)                                                   B   1920
166   FORMAT(1H1,12A6)
  170 FORMAT (20I4)                                                   B   1930
171   FORMAT(1H ,20I4)
  175 FORMAT (10F8.3)                                                 B   1940
176   FORMAT(1H ,10F8.3)
  180 FORMAT (3F10.2,I4)                                              B   1950
181   FORMAT(1H ,3F10.4,I4)
  185 FORMAT (42X,3I2,I6)                                             B   1960
  190 FORMAT (1H0/25H BASED ON BASIC DATA FROM,I3,1H/,I2,1H/,I2,8H RUN NB   1970
     10.,I6,4H AND,I3,1H/,I2,1H/,I2,8H RUN NO.,I6/)                   B   1980
  195 IF (NTHETA.NE.0) GO TO 205                                      B   1990
      NCUT=(XON(ISWIRL)/2+1)*2                                        B   2000
      FANN=2.*NCUT                                                    B   2010
      CALL PLOXIS(FANN,9.,1.,20.,-FANN/2.,0.,.15,.1,0,0,3,4,1,-1)     B   2020
      CALL SYMBOL(FANN-1.5,.5,.25,IDENT,0.,6)                         B   2030
      DO 200 IC=1,ICASE                                               B   2040
  200  CALL LINE(RCX(1,IC),RANG(1,IC),IPLOT(IC), 1,0,0,-FANN/2.,1.,0.,2.0B   2050
     1.)                                                              B   2060
      CALL PLOT(FANN+1.,0.,-3)                                        B   2070
  205 IF(CUTOFF.GT.0..OR.NTHETA.EQ.0) CALL PLOTID                     B   2080
      STOP                                                            B   2090
      END                                                             B   2100
```

```
      SUBROUTINE SINTP (Z,W,N,XI,YI)
      DIMENSION X(200), Y(200), Z(1), W(1)
      DO 10 I=1,N
      X(I)=Z(I)
   10 Y(I)=W(I)
      CALL SORTXY (X,Y,N)
C
      DO 15 I=1,N
      K=I
      IF (XI.GT.X(I)) GO TO 15
      IF (XI.EQ.X(I)) GO TO 20
      IF (XI.LT.X(I)) GO TO 25
   15 CONTINUE
   20 YI=Y(K)
      GO TO 30
   25 IF (K.EQ.1) GO TO 35
      IF (K.EQ.N) K=N-1
      IF (X(K).EQ.X(K+1)) K=K-1
      W1=(XI-X(K))*(XI-X(K+1))/(X(K-1)-X(K))/(X(K-1)-X(K+1))
      W2=(XI-X(K-1))*(XI-X(K+1))/(X(K)-X(K-1))/(X(K)-X(K+1))
      W3=(XI-X(K-1))*(XI-X(K))/(X(K+1)-X(K-1))/(X(K+1)-X(K))
      YI=Y(K-1)*W1+Y(K)*W2+Y(K+1)*W3
   30 RETURN
   35 YI=0.0
      RETURN
      END
```

```
      SUBROUTINE SORTXY(X,Y,NPTS)
      DIMENSION X(100),Y(100)
   10 N=NPTS
   15 NN=N-1
   20 DO 55 KT=1,NN
      XMIN=X(KT)
      JAD=KT
      JKL=KT+1
   25 DO 45 JK=JKL,N
   30 IF (XMIN-X(JK)) 45,45,35
   35 XMIN=X(JK)
   40 JAD=JK
   45 CONTINUE
   50 YMIN=Y(JAD)
      X(JAD)=X(KT)
      Y(JAD)=Y(KT)
      X(KT)=XMIN
      Y(KT)=YMIN
   55 CONTINUE
      RETURN
      END
```

```
SO.SSUB                                                             19 OCT 76   12
          SUBROUTINE SRTNE (XON,YON,XRI,YRIHUP,YRISHR,NHUBMX,NTMIN,S)     J  0000
          DIMENSION XON(1), YON(1), S(1)                                  J  0010
          COMMON /MONOF/ JJS,JJ                                           J  0020
C                                                                         J  0030
C         S  ROUTINE                                                      J  0040
C                                                                         J  0050
          IF (NHUBMX.LE.0) GO TO 35                                       J  0060
          XHB=XRI                                                         J  0070
          ISI=0                                                           J  0080
          IF (XON(1).GT.XHB) GO TO 15                                     J  0090
       10 ISI=ISI+1                                                       J  0100
          IF (XON(ISI)-XHB) 10,20,20                                      J  0110
       15                     XHB=XON(1)-(XON(2)-XON(1))/(YON(2)-YON(1))*(YON(1J  0120
         1)-YRIHUB)                                                       J  0130
          ISI=1                                                           J  0140
       20 S(ISI)=SQRT((YON(ISI)-XHB)**2+(YON(ISI)-YRIHUB)**2)             J  0150
          IS1=ISI+1                                                       J  0160
          DO 25 I=IS1,NHUBMX                                              J  0170
          S(I)=S(I-1)+SQRT((XON(I)-XON(I-1))**2+(YON(I)-YON(I-1))**2)     J  0180
       25 CONTINUE                                                        J  0190
          IS2=ISI-1                                                       J  0200
          S(IS2)=-SQRT((XON(IS2)-XHB)**2+(YON(IS2)-YRIHUB)**2)            J  0210
          IS3=ISI-2                                                       J  0220
          DO 30 I=1,IS3                                                   J  0230
          I39=IS2-I                                                       J  0240
          S(I39)=S(I39+1)-SQRT((XON(I39)-XON(I39+1))**2+(YON(I39)-YON(I39+1)J  0250
         1)**2)                                                           J  0260
       30 CONTINUE                                                        J  0270
       35 ISI=NHUBMX                                                      J  0280
       40 ISI=ISI+1                                                       J  0290
          IF (ISI.GT.(JJ+6)) GO TO 45                                     J  0300
          IF (XON(ISI)-XRI) 50,50,40                                      J  0310
       45 ISI=JJ                                                          J  0320
          IF(YON(JJ).LT.YRISHR) ISI=ISI+1                                 J  0330
       50 S(ISI)=-SQRT((XON(ISI)-XRI)**2+(YON(ISI)-YRISHR)**2)            J  0340
          IS1=ISI+1                                                       J  0350
          DO 55 I=IS1,NTMIN                                               J  0360
          S(I)=S(I-1)-SQRT((XON(I)-XON(I-1))**2+(YON(I)-YON(I-1))**2)     J  0370
       55 CONTINUE                                                        J  0380
          IS2=ISI-1                                                       J  0390
          S(IS2)=SQRT((XON(IS2)-XRI)**2+(YON(IS2)-YRISHR)**2)             J  0400
          ISMIN=NHUBMX+1                                                  J  0410
          IS3=ISI-2                                                       J  0420
          DO 60 I=ISMIN,IS3                                               J  0430
          I39=IS2-I+NHUBMX                                                J  0440
          S(I39)=S(I39+1)+SQRT((XON(I39)-XON(I39+1))**2+(YON(I39)-YON(I39+1)J  0450
         1)**2)                                                           J  0460
       60 CONTINUE                                                        J  0470
C                                                                         J  0480
C         END OF S                                                        J  0490
C                                                                         J  0500
          RETURN                                                          J  0510
          END                                                             J  0520
```

```
SO.STREMLN                                                          19 OCT 76   12
      SUBROUTINE STRML(Y,Q,IQ,NRAKES  ,X,N)                            0   0000
      COMMON/B00/DELQ                                                  0   0010
      DIMENSION Y(1), Q(1), IQ(1), X(1), N(1,1)                        0   0020
C                                                                      0   0030
C     THIS SUBROUTINE CALCULATES STREAMLINES                           0   0040
C                                                                      0   0050
      WRITE (6,35)                                                     0   0060
      IF(DELQ.EQ.0.)DELQ=.1                                            0   0070
      IST=1                                                            0   0080
      IFN=IQ(1)                                                        0   0090
      DO 30 I=1,NRAKES                                                 0   0100
      NO=N(I,1)                                                        0   0110
      QSTRM=DELQ                                                       0   0120
      WRITE (6,40)X(NO)                                                0   0130
   10 L=IST                                                            0   0140
   15 IF (L.GE.IFN) GO TO 25                                           0   0150
      IF (.NOT.((QSTRM.GE.Q(L).AND.QSTRM.LE.Q(L+1)).OR.(QSTRM.LE.Q(L).AND  0160
     1.QSTRM.GE.Q(L+1)))) GO TO 20                                     0   0170
      YSTRM=Y(L)+ (Y(L+1)-Y(L))*(QSTRM-Q(L))/(Q(L+1)-Q(L))             0   0180
      WRITE (6,45)QSTRM,YSTRM                                          0   0190
   20 L=L+1                                                            0   0200
      GO TO 15                                                         0   0210
   25 QSTRM=QSTRM+DELQ                                                 0   0220
      IF (QSTRM.LE.1.0) GO TO 10                                       0   0230
      IST=IFN+1                                                        0   0240
      IFN=IFN+IQ(I+1)                                                  0   0250
   30 CONTINUE                                                         0   0260
      RETURN                                                           0   0270
C                                                                      0   0280
   35 FORMAT (1H0,10X,11HSTREAMLINES/)                                 0   0290
   40 FORMAT (1H0,10X,4HX = ,F7.3/10X,5HQSTRM,10X,5HYSTRM)             0   0300
   45 FORMAT (5X,1PE12.5,6X,1PE12.5)                                   0   0310
      END                                                              0   0320
```

SO.TRAPS 19 OCT 76 12

```
      SUBROUTINE TRAP(X,Y,ANS,II)
      DIMENSION X(50),Y(50)
      SUM = 0
      DO 10 I=2,II
      ADD=        .5*(Y(I)+Y(I-1))*(X(I)-X(I-1))
      SUM=SUM+ADD
   10 CONTINUE
   15 FORMAT(1X,2E14.8)
      ANS = SUM
      RETURN
      END
```

```
      SUBROUTINE VAROFF (I,BETA,ALFA,VX,VRES,X,Y)
      DIMENSION BETA(1), ALFA(1), VX(1), VRES(1), X(1), Y(1)
      COMMON /TOUT1/ SINTH,COSTH,OMEGA
      COMMON /NIN/ XOFF(200),YOFF(200),NPMIN,NCLO,NCHI
      COMMON /COUT1/ QCA,PTC,PSPTCI,PIO180,ATOTAL,GRHO
      COMMON /VOUT1/ PSOPC(100),PHII(100),ZETAI(100),VYI(100),CPC(100),VM
     1ZI(100),VMI(100),VAFTI(100),VSPANI(100),ETAI(100)
      COMMON /VOUT2/ UI(100),VZPRI(100),BETAPI(100),VPRI(100),VZPRST(100
     1),BETAPS(100),VPRST(100),MPRST(100),MPRI(100)
      REAL MPRST,MPRI
      VCAN=.2*(VRES(I)/ATOTAL)**2
      IF (VCAN.LE.1.0) GO TO 10
      PSOPC(I)=0.0
      MPRI(I)=0.0
      MPRST(I)=0.0
      GO TO 15
   10 PSOPC(I)=(1.0-VCAN)**3.5
   15 VYI(I)=VX(I)*TAN(ALFA(I)*PIO180)
      CPC(I)=SQRT(5.*(1./PSOPC(I)**(1./3.5)-1.))
      VZI(I)=VRES(I)*SIN(BETA(I)*PIO180)
      VMI(I)=SQRT(VX(I)**2+VYI(I)**2)
      VAFTI(I)=VZI(I)*SINTH+VYI(I)*COSTH
      VSPANI(I)=VYI(I)*SINTH-VZI(I)*COSTH
      ETAI(I)=ATAN2(VAFTI(I),VX(I))/PIO180
      ZETAI(I)=ATAN2(VSPANI(I),VX(I))/PIO180
      PHII(I)=ATAN2(VZI(I),VX(I))/PIO180
C
C     IF X IS NOT AT THE CONTROL STATION SKIP FOLLOWING CALCULATIONS
C
      IF (X(I).NE.XOFF(NCLO)) RETURN
      UI(I)=OMEGA*Y(I)
      VZPRI(I)=VZI(I)-UI(I)
      BETAPI(I)=ATAN2(VZPRI(I),VMI(I))
      VPRI(I)=VMI(I)/COS(BETAPI(I))
      BETAPI(I)=BETAPI(I)/PIO180
      IF (VCAN.GT.1.0) GO TO 20
      VCON=VPRI(I)/ATOTAL
      MPRI(I)=VCON/((1.0-VCAN)**.5)
   20 VZPRST(I)=-VZI(I)-UI(I)
      BETAPS(I)=ATAN2(VZPRST(I),VMI(I))
      VPRST(I)=VMI(I)/COS(BETAPS(I))
      BETAPS(I)=BETAPS(I)/PIO180
      IF (VCAN.GT.1.0) RETURN
      VPCON=VPRST(I)/ATOTAL
      MPRST(I)=VPCON/((1.0-VCAN)**.5)
      RETURN
      END
```

SO.VBART 19 OCT 76 12

```
      SUBROUTINE VBARIT (VBAR,ATOTAL,RHOTOT,RHOBAR)
C      APPROACH 5
C
C
C     TO SOLVE VBAR COMP ITERATIVELY
C
      VCRIT=ATOTAL/SQRT(1.2)
      I=0
      VGUES=VBAR
   10 VGUESA=(VGUES/ATOTAL)**2
      A=1.0-.2*VGUESA
      B=A-VGUESA
      VCOMP=(VBAR-A**2.5*VGUES)/(A**1.5*B)+VGUES
      IF (ABS((VCOMP-VGUES)/VCOMP).LT..0001) GO TO 15
      I=I+1
      IF (VCOMP.GE.VCRIT) VCOMP=.5*(VGUES+VCRIT)
      VGUES=VCOMP
      IF (I.GT.20) GO TO 15
      GO TO 10
   15 RHOBAR=(1.0-.2*(VCOMP/ATOTAL)**2)**2.5*RHOTOT
      IF (I.GT.20) WRITE (6,20)VBAR,VCOMP,RHOBAR
      IF(I.GT.20) VBAR=VCOMP*RHOBAR/RHOTOT
      RETURN
C
   20 FORMAT (1H0,34HI EXCEEDS 20 ITERATIONS FOR RHOBAR,5X,7HVBAR = ,1PE
     110.3,2X,8HVCOMP = ,1PE10.3,2X,9HRHOBAR = ,1PE10.3/
     270H VBAR HAS BEEN REDUCED TO VCOMP*RHOBAR/RHOTOT,WHERE VCOMP=VCRIT
     3ICAL
      END
```

INPUT AND OUTPUT FOR TEST CASE

Program SCIRCL

(a) Printed Output:

GEOMETRY ONLY, SCIRCLE RELEASE 2-0 DATE 053177

INPUT FILE DUMP

```
 TEST CASE RELEASE 2.0
 12.00     0.0       1.00      7.00      0.00      1.00

BFQC1  EOD       1 1
  2.30     .250      1.00      11.6      0.00
 9
-0.5     0.0      6.5       10
 0.0     0.0      5.5       10
 0.5     0.0      0.0       10
 1.0     0.0      0.0       10
 1.500   0.0      0.0       10
 1.698   0.0      0.0       10
 2.698   0.0      0.0       10
 3.698   0.0      0.0       10
 11.600  0.0      0.0       10
  1.0      2.0
   0.0     2.0       2.0
 8.011     8.011                                 11.611    36.00
 -1.00       0.0                                    2.400     2.400
   1.00
 11.611    36.00
   2.400     2.400
  2.0      6.0
 1.0
 36.00     11.611
 6.00      6.00
 -3.00
 12.611    11.611    1.698                     .500
 6.00      6.00      4.991                     4.991
 1000.00   2.0      2.0
 3.00      1.698                                 0.00     0.0
 4.991      4.991                                5.840    7.00
 1000.
 0.00      0.00      .258       .774      2.581     4.00
 4.000     5.840     6.119      6.277     6.453     6.453
 1.0
 2.581     11.611
 6.453     6.453
 1.00
 11.611    36.00
 6.453     6.453
```

```
GEOMETRY ONLY, SCIRCLE RELEASE 2-0                                                              DATE  053177

 CASE  BFQCI                TEST CASE RELEASE 2.0

 FLAG INPUT, 1ST RECORD - FOREOD. 2ND - PUNCH,PLOT,REDO FLAGS
 0000         0
  BFQCI  EOD    011 1 0            0          000 0 0

           NO. OF BODIES = 2.      DELS =    .250      DELSMX =  1.000      XRI =  11.600000

   **** HUB *********
 ENREED=         .00

        EXPONENTS           SUPERELLIPSE
       P =  2.000      X      8.0110+00      8.0110+00      0.0000      0.0000      1.1611+01      3.6000+01
       Q =  2.000      Y     -1.0000+00      0.0000         0.0000      0.0000      2.4000+00      2.4000+00

    P =      .20000000+01     A =     .24000000+01       XO =     .70110000+01
    Q =      .20000000+01     B =     .35999999+01       YO =     .25999999+01    OMEGA =     .00000000

        3  ITERATIONS---
     DELS IN =   .25000    DELS =    .25509    DELS OUT =    .25509   DSTEST =    .24595

    LAST POINT K=   21, X=   .11611+02, Y=   .24000+01,KAPPA=  -.18519+00,DY/DX=   .00000   ,ALPHA=   .00000

          ENREED            STRAIGHT LINE
           1.000       X      1.1611+01      3.6000+01
                       Y      2.4000+00      2.4000+00

    LAST POINT K=   49, X=   .36000+02, Y=   .24000+01,KAPPA=   .00000   ,DY/DX=   .00000   ,ALPHA=   .00000

   **** SHROUD ******

          ENREED            STRAIGHT LINE
           1.000       X      3.6000+01      1.1611+01
                       Y      6.0000+00      6.0000+00

    LAST POINT K=   78, X=   .11611+02, Y=   .60000+01,KAPPA=   .00000   ,DY/DX=   .00000   ,ALPHA=   .00000

          ENREED            CUBIC
          -3.000       X      1.2611+01      1.1611+01      1.6980+00      5.0000-01
                       Y      6.0000+00      6.0000+00      4.9910+00      4.9910+00

      2  ITERATIONS   A =  -2.07160-03   B =   4.13564-02   C =  -1.22528-01   D =   5.08996+00
   DELS IN =   .25509   DELS =    .25525   DELS OUT =   .25525    DSTEST =    .25194

    LAST POINT K=  119, X=   .16980+01, Y=   .49910+01,KAPPA=   .61605-01,DY/DX=   .12951-04,ALPHA=   .74204-03
 ENREED=   1000.00

        EXPONENTS           SUPERELLIPSE
       P =  2.000      X      3.0000+00      1.6980+00      0.0000      0.0000      0.0000      0.0000
       Q =  2.000      Y      4.9910+00      4.9910+00      0.0000      0.0000      5.8400+00      7.0000+00

    P =      .20000000+01     A =     .16980000+01       XO =     .16980000+01
    Q =      .20000000+01     B =     .84899998+00       YO =     .58400000+01    OMEGA =     .00000000

        8  ITERATIONS---
     DELS IN =   .25525    DELS =    .18050    DELS OUT =    .07170   DSTEST =    .06552    FINAL PACE=    .05000
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LAST POINT K= 137, X= .00000 , Y= .58400+01,KAPPA= -.23557+01,DY/DX= -.99999+05,ALPHA= -.89999+02
ENREED= 1000.00

EXPONENTS		SUPERELLIPSE					
P = .000	X	0.0000	0.0000	2.5800-01	7.7400-01	2.5810+00	4.0000+00
Q = .000	Y	4.3000+00	5.8400+00	6.1190+00	6.2770+00	6.4530+00	6.4530+00

P = .22586403+01 A = .61300004+00 X0 = -.18400000+01
Q = .17577100+01 B = .25810000+01 Y0 = .65810000+01 OMEGA = .00000000

8 ITERATIONS---
DELS IN = .07170 DELS = .07170 DELS OUT = .25525 DSTEST = .00177 FINAL PACE= .05157

LAST POINT K= 160, X= .25810+01, Y= .64530+01,KAPPA= -.31705+00,DY/DX= .00000 ,ALPHA= .00000

ENREED		STRAIGHT LINE	
1.000	X	2.5810+00	1.1611+01
	Y	6.4530+00	6.4530+00

LAST POINT K= 195, X= .11611+02, Y= .64530+01,KAPPA= .00000 ,DY/DX= .00000 ,ALPHA= .00000

ENREED		STRAIGHT LINE	
1.000	X	1.1611+01	3.6003+01
	Y	6.4530+00	6.4530+00

LAST POINT K= 223, X= .36000+02, Y= .64530+01,KAPPA= .00000 ,DY/DX= .00000 ,ALPHA= .00000

INPUT FOR THE COMBINE PROGRAM NT(1)= 226 NT(2)= 221 NHLSMX= 48 NP= 90

BODY 1 CO-ORDINATES	- X	Y	KAPPA	DY/DX	ALPHA	S	S-S(2)	DELTAS
1	.80110+01	.00000	-.62500+00	.99900+03	.90000+02	.00000	-.47472+01	.00000
2	.80275+01	.22962+00	-.61442+00	.69360+01	.81796+02	.23022+00	-.45170+01	.23022+00
3	.80769+01	.45723+00	-.58476+00	.34355+01	.73771+02	.46309+00	-.42841+01	.23288+00
4	.81559+01	.67395+00	-.54280+00	.22785+01	.66304+02	.69377+00	-.40534+01	.23068+00
5	.82618+01	.88020+00	-.49504+00	.16911+01	.59403+02	.92566+00	-.38216+01	.23189+00
6	.83917+01	.10741+01	-.44701+00	.13321+01	.53105+02	.11590+01	-.35882+01	.23335+00
7	.85420+01	.12546+01	-.40221+00	.10872+01	.47392+02	.13939+01	-.33533+01	.23492+00
8	.87099+01	.14211+01	-.36235+00	.90730+00	.42217+02	.16304+01	-.31168+01	.23646+00
9	.88866+01	.15688+01	-.32893+00	.77183+00	.37662+02	.18607+01	-.28865+01	.23027+00
10	.90765+01	.17044+01	-.30021+00	.66091+00	.33461+02	.20940+01	-.26532+01	.23332+00
11	.92776+01	.18276+01	-.27590+00	.56746+00	.29573+02	.23298+01	-.24174+01	.23582+00
12	.94881+01	.19383+01	-.25553+00	.48677+00	.25956+02	.25677+01	-.21795+01	.23787+00
13	.97065+01	.20367+01	-.23861+00	.41560+00	.22568+02	.28072+01	-.19400+01	.23956+00
14	.99315+01	.21228+01	-.22468+00	.35162+00	.19373+02	.30482+01	-.16990+01	.24095+00
15	.10162+02	.21970+01	-.21333+00	.29312+00	.16337+02	.32903+01	-.14569+01	.24211+00
16	.10397+02	.22594+01	-.20423+00	.23882+00	.13432+02	.35334+01	-.12139+01	.24306+00
17	.10635+02	.23102+01	-.19712+00	.18768+00	.10630+02	.37772+01	-.97000+00	.24385+00
18	.10877+02	.23496+01	-.19180+00	.13889+00	.79072+01	.40217+01	-.72549+00	.24451+00
19	.11120+02	.23776+01	-.18809+00	.91746-01	.52420+01	.42668+01	-.48044+00	.24505+00
20	.11365+02	.23944+01	-.18591+00	.45640-01	.26132+01	.45123+01	-.23494+00	.24549+00
21	.11611+02	.24000+01	.00000	.00000	.00000	.47582+01	.11002-01	.24595+00
22	.11866+02	.24000+01	.00000	.00000	.00000	.50133+01	.26609+00	.25509+00
23	.12272+02	.24000+01	.00000	.00000	.00000	.53194+01	.57220+00	.30611+00
24	.12540+02	.24000+01	.00000	.00000	.00000	.56868+01	.93954+00	.36733+00
25	.12980+02	.24000+01	.00000	.00000	.00000	.61276+01	.13803+01	.44080+00

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26	.13509+02	.24000+01	.00000	.00000	.00000	.66565+01	.19093+01	.52896+00
27	.14144+02	.24000+01	.00000	.00000	.00000	.72913+01	.25440+01	.63475+00
28	.14906+02	.24000+01	.00000	.00000	.00000	.80530+01	.33057+01	.76170+00
29	.15820+02	.24000+01	.00000	.00000	.00000	.89670+01	.42198+01	.91404+00
30	.16829+02	.24000+01	.00000	.00000	.00000	.99760+01	.52288+01	.10090+01
31	.17838+02	.24000+01	.00000	.00000	.00000	.10985+02	.62378+01	.10090+01
32	.18847+02	.24000+01	.00000	.00000	.00000	.11994+02	.72468+01	.10090+01
33	.19856+02	.24000+01	.00000	.00000	.00000	.13003+02	.82558+01	.10090+01
34	.20865+02	.24000+01	.00000	.00000	.00000	.14012+02	.92648+01	.10090+01
35	.21874+02	.24000+01	.00000	.00000	.00000	.15021+02	.10274+02	.10090+01
36	.22883+02	.24000+01	.00000	.00000	.00000	.16030+02	.11283+02	.10090+01
37	.23892+02	.24000+01	.00000	.00000	.00000	.17039+02	.12292+02	.10090+01
38	.24901+02	.24000+01	.00000	.00000	.00000	.18048+02	.13301+02	.10090+01
39	.25910+02	.24000+01	.00000	.00000	.00000	.19057+02	.14310+02	.10090+01
40	.26919+02	.24000+01	.00000	.00000	.00000	.20066+02	.15319+02	.10090+01
41	.27928+02	.24000+01	.00000	.00000	.00000	.21075+02	.16328+02	.10090+01
42	.28937+02	.24000+01	.00000	.00000	.00000	.22084+02	.17337+02	.10090+01
43	.29946+02	.24000+01	.00000	.00000	.00000	.23093+02	.18346+02	.10090+01
44	.30955+02	.24000+01	.00000	.00000	.00000	.24102+02	.19355+02	.10090+01
45	.31964+02	.24000+01	.00000	.00000	.00000	.25111+02	.20364+02	.10090+01
46	.32973+02	.24000+01	.00000	.00000	.00000	.26120+02	.21373+02	.10090+01
47	.33982+02	.24000+01	.00000	.00000	.00000	.27129+02	.22382+02	.10090+01
48	.34991+02	.24000+01	.00000	.00000	.00000	.28138+02	.23391+02	.10090+01
49	.36000+02	.24000+01	.00000	.00000	.00000	.29147+02	.24400+02	.10090+01

BODY 2 CO-ORDINATES -	X	Y	KAPPA	DY/DX	ALPHA	S	S*(2)-S	DELTAS
50	.36000+02	.60000+01	.00000	.00000	.00000	.00000	.24400+02	.00000
51	.34991+02	.60000+01	.00000	.00000	.00000	.10090+01	.23391+02	.10090+01
52	.33982+02	.60000+01	.00000	.00000	.00000	.20180+01	.22382+02	.10090+01
53	.32973+02	.60000+01	.00000	.00000	.00000	.30270+01	.21373+02	.10090+01
54	.31964+02	.60000+01	.00000	.00000	.00000	.40360+01	.20364+02	.10090+01
55	.30955+02	.60000+01	.00000	.00000	.00000	.50451+01	.19355+02	.10090+01
56	.29946+02	.60000+01	.00000	.00000	.00000	.60541+01	.18346+02	.10090+01
57	.28937+02	.60000+01	.00000	.00000	.00000	.70631+01	.17337+02	.10090+01
58	.27928+02	.60000+01	.00000	.00000	.00000	.80721+01	.16328+02	.10090+01
59	.26919+02	.60000+01	.00000	.00000	.00000	.90811+01	.15319+02	.10090+01
60	.25910+02	.60000+01	.00000	.00000	.00000	.10090+02	.14310+02	.10090+01
61	.24901+02	.60000+01	.00000	.00000	.00000	.11099+02	.13301+02	.10090+01
62	.23892+02	.60000+01	.00000	.00000	.00000	.12108+02	.12292+02	.10090+01
63	.22883+02	.60000+01	.00000	.00000	.00000	.13117+02	.11283+02	.10090+01
64	.21874+02	.60000+01	.00000	.00000	.00000	.14126+02	.10274+02	.10090+01
65	.20865+02	.60000+01	.00000	.00000	.00000	.15135+02	.92648+01	.10090+01
66	.19856+02	.60000+01	.00000	.00000	.00000	.16144+02	.82558+01	.10090+01
67	.18847+02	.60000+01	.00000	.00000	.00000	.17153+02	.72468+01	.10090+01
68	.17838+02	.60000+01	.00000	.00000	.00000	.18162+02	.62378+01	.10090+01
69	.16829+02	.60000+01	.00000	.00000	.00000	.19171+02	.52288+01	.10090+01
70	.15820+02	.60000+01	.00000	.00000	.00000	.20180+02	.42198+01	.10090+01
71	.14906+02	.60000+01	.00000	.00000	.00000	.21094+02	.33057+01	.91404+00
72	.14144+02	.60000+01	.00000	.00000	.00000	.21856+02	.25440+01	.76170+00
73	.13509+02	.60000+01	.00000	.00000	.00000	.22491+02	.19093+01	.63475+00
74	.12980+02	.60000+01	.00000	.00000	.00000	.23020+02	.13803+01	.52896+00
75	.12540+02	.60000+01	.00000	.00000	.00000	.23460+02	.93953+00	.44080+00
76	.12172+02	.60000+01	.00000	.00000	.00000	.23828+02	.57220+00	.36733+00
77	.11866+02	.60000+01	.00000	.00000	.00000	.24134+02	.26609+00	.30611+00
78	.11611+02	.60000+01	-.61607-01	.74506-08	.42689-06	.24389+02	.10999-01	.25509+00
79	.11359+02	.59981+01	-.58453-01	.15139-01	.86732+00	.24641+02	-.24115+00	.25215+00

80	.11108+02	.59925+01	-.55289-01	.29391-01	.16835+01	.24892+02	-.49162+00	.25047+00
81	.10860+02	.59835+01	-.52125-01	.42782-01	.24497+01	.25141+02	-.74061+00	.24899+00
82	.10612+02	.59713+01	-.48968-01	.55331-01	.31670+01	.25388+02	-.98829+00	.24768+00
83	.10366+02	.59563+01	-.45825-01	.67060-01	.38365+01	.25635+02	-.12348+01	.24652+00
84	.10121+02	.59385+01	-.42701-01	.77983-01	.44591+01	.25880+02	-.14803+01	.24550+00
85	.98776+01	.59182+01	-.39599-01	.88118-01	.50358+01	.26125+02	-.17249+01	.24460+00
86	.96348+01	.58957+01	-.36522-01	.97477-01	.55674+01	.26369+02	-.19687+01	.24382+00
87	.93929+01	.58711+01	-.33471-01	.10607+00	.60549+01	.26612+02	-.22119+01	.24313+00
88	.91518+01	.58445+01	-.30446-01	.11392+00	.64990+01	.26854+02	-.24544+01	.24254+00
89	.89115+01	.58163+01	-.27448-01	.12102+00	.69008+01	.27096+02	-.26964+01	.24203+00
90	.86717+01	.57865+01	-.24475-01	.12739+00	.72598+01	.27338+02	-.29380+01	.24160+00
91	.84325+01	.57553+01	-.21526-01	.13303+00	.75777+01	.27579+02	-.31793+01	.24124+00
92	.81937+01	.57229+01	-.18598-01	.13795+00	.78546+01	.27820+02	-.34202+01	.24095+00
93	.79553+01	.56895+01	-.15691-01	.14216+00	.80911+01	.28061+02	-.36609+01	.24072+00
94	.77172+01	.56553+01	-.12800-01	.14566+00	.82874+01	.28301+02	-.39015+01	.24054+00
95	.74794+01	.56203+01	-.99231-02	.14845+00	.84439+01	.28542+02	-.41419+01	.24042+00
96	.72417+01	.55847+01	-.70571-02	.15054+00	.85608+01	.28782+02	-.43822+01	.24035+00
97	.70040+01	.55488+01	-.41985-02	.15192+00	.86383+01	.29023+02	-.46226+01	.24033+00
98	.67664+01	.55126+01	-.13439-02	.15260+00	.86764+01	.29263+02	-.48629+01	.24036+00
99	.65287+01	.54763+01	.15101-02	.15258+00	.86753+01	.29503+02	-.51034+01	.24044+00
100	.62911+01	.54401+01	.43656-02	.15186+00	.86348+01	.29744+02	-.53438+01	.24042+00
101	.60534+01	.54042+01	.72243-02	.15043+00	.85550+01	.29984+02	-.55841+01	.24032+00
102	.58158+01	.53687+01	.10090-01	.14831+00	.84359+01	.30224+02	-.58244+01	.24027+00
103	.55781+01	.53337+01	.12966-01	.14548+00	.82772+01	.30465+02	-.60646+01	.24027+00
104	.53402+01	.52995+01	.15854-01	.14194+00	.80788+01	.30705+02	-.63050+01	.24032+00
105	.51021+01	.52662+01	.18759-01	.13770+00	.78404+01	.30945+02	-.65454+01	.24042+00
106	.48637+01	.52343+01	.21683-01	.13275+00	.75617+01	.31186+02	-.67860+01	.24058+00
107	.46249+01	.52029+01	.24628-01	.12708+00	.72422+01	.31427+02	-.70268+01	.24080+00
108	.43857+01	.51733+01	.27595-01	.12069+00	.68816+01	.31668+02	-.72678+01	.24108+00
109	.41459+01	.51452+01	.30587-01	.11357+00	.64792+01	.31909+02	-.75093+01	.24143+00
110	.39055+01	.51188+01	.33604-01	.10571+00	.60345+01	.32151+02	-.77511+01	.24185+00
111	.36644+01	.50944+01	.36647-01	.97112-01	.55467+01	.32393+02	-.79935+01	.24236+00
112	.34225+01	.50720+01	.39713-01	.87758-01	.50153+01	.32636+02	-.82364+01	.24295+00
113	.31796+01	.50519+01	.42803-01	.77637-01	.44394+01	.32880+02	-.84801+01	.24364+00
114	.29359+01	.50343+01	.45914-01	.66738-01	.38181+01	.33124+02	-.87245+01	.24443+00
115	.26910+01	.50193+01	.49042-01	.55046-01	.31507+01	.33370+02	-.89698+01	.24534+00
116	.24449+01	.50073+01	.52182-01	.42546-01	.24363+01	.33616+02	-.92162+01	.24638+00
117	.21975+01	.49984+01	.55328-01	.29221-01	.16738+01	.33864+02	-.94638+01	.24756+00
118	.19486+01	.49929+01	.58472-01	.15050-01	.86226+00	.34113+02	-.97127+01	.24891+00
119	.16980+01	.49910+01	.29446+00	.00000	.00000	.34363+02	-.99633+01	.25064+00
120	.15265+01	.49953+01	.29787+00	-.50751-01	-.29053+01	.34535+02	-.10135+02	.17153+00
121	.13638+01	.50076+01	.30778+00	-.10036+00	-.57310+01	.34698+02	-.10298+02	.16315+00
122	.12099+01	.50268+01	.32413+00	-.15[illegible]07+00	-.85349+01	.34853+02	-.10453+02	.15518+00
123	.10645+01	.50523+01	.34743+00	-.20107+00	-.11369+02	.35001+02	-.10601+02	.14760+00
124	.92755+00	.50834+01	.37870+00	-.25458+00	-.14283+02	.35141+02	-.10741+02	.14042+00
125	.79897+00	.51198+01	.41956+00	-.31206+00	-.17331+02	.35275+02	-.10875+02	.13362+00
126	.67865+00	.51610+01	.47240+00	-.37532+00	-.20572+02	.35402+02	-.11002+02	.12720+00
127	.56654+00	.52069+01	.54057+00	-.44683+00	-.24076+02	.35523+02	-.11123+02	.12116+00
128	.46268+00	.52575+01	.62879+00	-.53018+00	-.27932+02	.35639+02	-.11239+02	.11551+00
129	.36912+00	.53115+01	.74075+00	-.62859+00	-.32153+02	.35747+02	-.11347+02	.10802+00
130	.28454+00	.53695+01	.88463+00	-.75110+00	-.36910+02	.35849+02	-.11449+02	.10258+00
131	.20945+00	.54315+01	.10680+01	-.91104+00	-.42335+02	.35947+02	-.11547+02	.97373-01
132	.14455+00	.54972+01	.12965+01	-.11330+01	-.48567+02	.36039+02	-.11639+02	.92343-01
133	.92773-01	.55632+01	.15553+01	-.14499+01	-.55405+02	.36123+02	-.11723+02	.83882-01
134	.51724-01	.56320+01	.18378+01	-.19791+01	-.63194+02	.36203+02	-.11803+02	.80146-01
135	.22269-01	.57030+01	.21042+01	-.30568+01	-.71885+02	.36280+02	-.11880+02	.76778-01
136	.50333-02	.57747+01	.22943+01	-.64793+01	-.81226+02	.36354+02	-.11954+02	.73770-01

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137	.00000	.58400+01	.00000	.99900+03	.90000+02	.36419+02	-.12019+02	.65516-01
138	.10247-01	.59080+01	-.53794+01	.29337+01	.71178+02	.36488+02	-.12088+02	.68766-01
139	.40365-01	.59645+01	-.39704+01	.13577+01	.53627+02	.36552+02	-.12152+02	.64052-01
140	.81239-01	.60093+01	-.26050+01	.91132+00	.42344+02	.36612+02	-.12212+02	.60602-01
141	.12412+00	.60436+01	-.18144+01	.71279+00	.35481+02	.36667+02	-.12267+02	.54995-01
142	.17501+00	.60763+01	-.12827+01	.58181+00	.30191+02	.36728+02	-.12328+02	.60467-01
143	.23321+00	.61072+01	-.93113+00	.48911+00	.26064+02	.36794+02	-.12394+02	.65926-01
144	.29837+00	.61367+01	-.69505+00	.41972+00	.22769+02	.36865+02	-.12465+02	.71519-01
145	.37044+00	.61649+01	-.53242+00	.36543+00	.20074+02	.36943+02	-.12543+02	.77378-01
146	.44952+00	.61920+01	-.41734+00	.32141+00	.17818+02	.37026+02	-.12626+02	.83590-01
147	.53588+00	.62181+01	-.33385+00	.28467+00	.15890+02	.37117+02	-.12717+02	.90218-01
148	.62987+00	.62433+01	-.27193+00	.25325+00	.14212+02	.37214+02	-.12814+02	.97318-01
149	.73194+00	.62677+01	-.22516+00	.22582+00	.12725+02	.37319+02	-.12919+02	.10494+00
150	.84258+00	.62913+01	-.18931+00	.20142+00	.11388+02	.37432+02	-.13032+02	.11313+00
151	.96238+00	.63141+01	-.16151+00	.17935+00	.10168+02	.37554+02	-.13154+02	.12194+00
152	.10920+01	.63360+01	-.13981+00	.15906+00	.90380+01	.37685+02	-.13285+02	.13142+00
153	.12320+01	.63569+01	-.12237+00	.14011+00	.79759+01	.37827+02	-.13427+02	.14163+00
154	.13834+01	.63767+01	-.10976+00	.12211+00	.69620+01	.37980+02	-.13580+02	.15262+00
155	.15468+01	.63952+01	-.99911-01	.10470+00	.59771+01	.38144+02	-.13744+02	.16446+00
156	.17232+01	.64121+01	-.93356-01	.87495-01	.50004+01	.38321+02	-.13921+02	.17721+00
157	.19136+01	.64271+01	-.89356-01	.70031-01	.40059+01	.38512+02	-.14112+02	.19094+00
158	.21189+01	.64396+01	-.89869-01	.51616-01	.29547+01	.38718+02	-.14318+02	.20574+00
159	.23404+01	.64488+01	-.99090-01	.30883-01	.17689+01	.38940+02	-.14540+02	.22168+00
160	.25810+01	.64530+01	.00000	.00000	.00000	.39180+02	-.14780+02	.24063+00
161	.28390+01	.64530+01	.00000	.00000	.00000	.39438+02	-.15038+02	.25800+00
162	.30970+01	.64530+01	.00000	.00000	.00000	.39696+02	-.15296+02	.25800+00
163	.33550+01	.64530+01	.00000	.00000	.00000	.39954+02	-.15554+02	.25800+00
164	.36130+01	.64530+01	.00000	.00000	.00000	.40212+02	-.15812+02	.25800+00
165	.38710+01	.64530+01	.00000	.00000	.00000	.40470+02	-.16070+02	.25800+00
166	.41290+01	.64530+01	.00000	.00000	.00000	.40728+02	-.16328+02	.25800+00
167	.43870+01	.64530+01	.00000	.00000	.00000	.40986+02	-.16586+02	.25800+00
168	.46450+01	.64530+01	.00000	.00000	.00000	.41244+02	-.16844+02	.25800+00
169	.49030+01	.64530+01	.00000	.00000	.00000	.41502+02	-.17102+02	.25800+00
170	.51610+01	.64530+01	.00000	.00000	.00000	.41760+02	-.17360+02	.25800+00
171	.54190+01	.64530+01	.00000	.00000	.00000	.42018+02	-.17618+02	.25800+00
172	.56770+01	.64530+01	.00000	.00000	.00000	.42276+02	-.17876+02	.25800+00
173	.59350+01	.64530+01	.00000	.00000	.00000	.42534+02	-.18134+02	.25800+00
174	.61930+01	.64530+01	.00000	.00000	.00000	.42792+02	-.18392+02	.25800+00
175	.64510+01	.64530+01	.00000	.00000	.00000	.43050+02	-.18650+02	.25800+00
176	.67090+01	.64530+01	.00000	.00000	.00000	.43308+02	-.18908+02	.25800+00
177	.69670+01	.64530+01	.00000	.00000	.00000	.43566+02	-.19166+02	.25800+00
178	.72250+01	.64530+01	.00000	.00000	.00000	.43824+02	-.19424+02	.25800+00
179	.74830+01	.64530+01	.00000	.00000	.00000	.44082+02	-.19682+02	.25800+00
180	.77410+01	.64530+01	.00000	.00000	.00000	.44340+02	-.19940+02	.25800+00
181	.79990+01	.64530+01	.00000	.00000	.00000	.44598+02	-.20198+02	.25800+00
182	.82570+01	.64530+01	.00000	.00000	.00000	.44856+02	-.20456+02	.25800+00
183	.85150+01	.64530+01	.00000	.00000	.00000	.45114+02	-.20714+02	.25800+00
184	.87730+01	.64530+01	.00000	.00000	.00000	.45372+02	-.20972+02	.25800+00
185	.90310+01	.64530+01	.00000	.00000	.00000	.45630+02	-.21230+02	.25800+00
186	.92890+01	.64530+01	.00000	.00000	.00000	.45888+02	-.21488+02	.25800+00
187	.95470+01	.64530+01	.00000	.00000	.00000	.46146+02	-.21746+02	.25800+00
188	.98050+01	.64530+01	.00000	.00000	.00000	.46404+02	-.22004+02	.25800+00
189	.10063+02	.64530+01	.00000	.00000	.00000	.46662+02	-.22262+02	.25800+00
190	.10321+02	.64530+01	.00000	.00000	.00000	.46920+02	-.22520+02	.25800+00
191	.10579+02	.64530+01	.00000	.00000	.00000	.47178+02	-.22778+02	.25800+00
192	.10837+02	.64530+01	.00000	.00000	.00000	.47436+02	-.23036+02	.25800+00
193	.11095+02	.64530+01	.00000	.00000	.00000	.47694+02	-.23294+02	.25800+00

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194	.11353+02	.64530+01	.00000	.00000	.00000	.47952+02	-.23552+02	.25800+00
195	.11611+02	.64530+01	.00000	.00000	.00000	.48210+02	-.23810+02	.25800+00
196	.11869+02	.64530+01	.00000	.00000	.00000	.48468+02	-.24068+02	.25800+00
197	.12179+02	.64530+01	.00000	.00000	.00000	.48778+02	-.24378+02	.30960+00
198	.12550+02	.64530+01	.00000	.00000	.00000	.49149+02	-.24749+02	.37152+00
199	.12996+02	.64530+01	.00000	.00000	.00000	.49595+02	-.25195+02	.44582+00
200	.13531+02	.64530+01	.00000	.00000	.00000	.50130+02	-.25730+02	.53499+00
201	.14173+02	.64530+01	.00000	.00000	.00000	.50772+02	-.26372+02	.64199+00
202	.14943+02	.64530+01	.00000	.00000	.00000	.51543+02	-.27143+02	.77038+00
203	.15868+02	.64530+01	.00000	.00000	.00000	.52467+02	-.28067+02	.92446+00
204	.16874+02	.64530+01	.00000	.00000	.00000	.53474+02	-.29074+02	.10066+01
205	.17881+02	.64530+01	.00000	.00000	.00000	.54480+02	-.30080+02	.10066+01
206	.18888+02	.64530+01	.00000	.00000	.00000	.55487+02	-.31087+02	.10066+01
207	.19894+02	.64530+01	.00000	.00000	.00000	.56493+02	-.32093+02	.10066+01
208	.20901+02	.64530+01	.00000	.00000	.00000	.57500+02	-.33100+02	.10066+01
209	.21907+02	.64530+01	.00000	.00000	.00000	.58507+02	-.34107+02	.10066+01
210	.22914+02	.64530+01	.00000	.00000	.00000	.59513+02	-.35113+02	.10066+01
211	.23921+02	.64530+01	.00000	.00000	.00000	.60520+02	-.36120+02	.10066+01
212	.24927+02	.64530+01	.00000	.00000	.00000	.61526+02	-.37126+02	.10066+01
213	.25934+02	.64530+01	.00000	.00000	.00000	.62533+02	-.38133+02	.10066+01
214	.26940+02	.64530+01	.00000	.00000	.00000	.63540+02	-.39140+02	.10066+01
215	.27947+02	.64530+01	.00000	.00000	.00000	.64546+02	-.40146+02	.10066+01
216	.28954+02	.64530+01	.00000	.00000	.00000	.65553+02	-.41153+02	.10066+01
217	.29960+02	.64530+01	.00000	.00000	.00000	.66560+02	-.42160+02	.10066+01
218	.30967+02	.64530+01	.00000	.00000	.00000	.67566+02	-.43166+02	.10066+01
219	.31974+02	.64530+01	.00000	.00000	.00000	.68573+02	-.44173+02	.10066+01
220	.32980+02	.64530+01	.00000	.00000	.00000	.69579+02	-.45179+02	.10066+01
221	.33987+02	.64530+01	.00000	.00000	.00000	.70586+02	-.46186+02	.10066+01
222	.34993+02	.64530+01	.00000	.00000	.00000	.71593+02	-.47193+02	.10066+01
223	.36000+02	.64530+01	.00000	.00000	.00000	.72599+02	-.48199+02	.10066+01

BODY 3 CO-ORDINATES - X Y

	X	Y
224	.36000+02	.24000+01
225	.36000+02	.31200+01
226	.36000+02	.38400+01
227	.36000+02	.45600+01
228	.36000+02	.52800+01
229	.36000+02	.60000+01

XRAK	YLO	YHI	NDY
-.50000+00	.00000	.65000+01	10
.00000	.00000	.55000+01	10
.50000+00	.00000	.51229+01	10
.10000+01	.00000	.49257+01	10
.15000+01	.00000	.48336+01	10
.16980+01	.00000	.48195+01	10
.26980+01	.00000	.47744+01	10
.36980+01	.00000	.48553+01	10
.11600+02	.26458+01	.57478+01	10

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I	XON	YON	YONH	AREA	DISC AREA	ENSUBK
50	3.6000+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
51	3.4991+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
52	3.3982+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
53	3.2973+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
54	3.1964+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
55	3.0955+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
56	2.9946+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
57	2.8937+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
58	2.7928+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
59	2.6919+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
60	2.5910+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
61	2.4901+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
62	2.3892+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
63	2.2883+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
64	2.1874+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
65	2.0865+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
66	1.9856+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
67	1.8847+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000

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68	1.7838+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
69	1.6829+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
70	1.5820+01	6.0000+00	2.4000+00	9.5302+01	1.1310+02	0.0000
71	1.4906+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
72	1.4144+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
73	1.3509+01	6.0000+00	2.4000+00	9.5332+01	1.1310+02	0.0000
74	1.2980+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
75	1.2540+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
76	1.2172+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	0.0000
77	1.1866+01	6.0000+00	2.4000+00	9.5032+01	1.1310+02	0.0000
78	1.1611+01	6.0000+00	2.4000+00	9.5002+01	1.1310+02	-1.8744-01
79	1.1359+01	5.9981+00	2.3941+00	9.5018+01	1.1302+02	-1.7810-01
80	1.1108+01	5.9925+00	2.3765+00	9.5371+01	1.1281+02	-1.6917-01
81	1.0860+01	5.9835+00	2.3471+00	9.5169+01	1.1248+02	-1.6064-01
82	1.0612+01	5.9713+00	2.3058+00	9.5317+01	1.1202+02	-1.5246-01
83	1.0366+01	5.9563+00	2.2519+00	9.5523+01	1.1145+02	-1.4460-01
84	1.0121+01	5.9385+00	2.1849+00	9.5794+01	1.1079+02	-1.3705-01
85	9.8776+00	5.9182+00	2.1034+00	9.6136+01	1.1004+02	-1.2976-01
86	9.6348+00	5.8957+00	2.0060+00	9.6558+01	1.0920+02	-1.2271-01

87	9.3929+00	5.8711+00	1.8902+00	9.7064+01	1.0829+02	-1.1589-01
88	9.1518+00	5.8445+00	1.7526+00	9.7663+01	1.0731+02	-1.0927-01
89	8.9115+00	5.8163+00	1.5876+00	9.8358+01	1.0628+02	-1.0287-01
90	8.6717+00	5.7865+00	1.3854+00	9.9161+01	1.0519+02	-9.6754-02
91	8.4325+00	5.7553+00	1.1260+00	1.0338+02	1.0406+02	-9.1131-02
92	8.1937+00	5.7229+00	7.5256-01	1.0111+02	1.0289+02	-8.6904-02
93	7.9553+00	5.6895+00	0.0000	1.0170+02	1.0170+02	-8.9273-02
94	7.7172+00	5.6553+00	0.0000	1.0347+02	1.0047+02	-7.2387-02
95	7.4794+00	5.6203+00	0.0000	9.9235+01	9.9235+01	-5.5770-02
96	7.2417+00	5.5847+00	0.0000	9.7984+01	9.7984+01	-3.9412-02
97	7.0040+00	5.5488+00	0.0000	9.6726+01	9.6726+01	-2.3297-02
98	6.7664+00	5.5126+00	0.0000	9.5469+01	9.5469+01	-7.4086-03
99	6.5287+00	5.4763+00	0.0000	9.4216+01	9.4216+01	8.2700-03
100	6.2911+00	5.4401+00	0.0000	9.2975+01	9.2975+01	2.3749-02
101	6.0534+00	5.4042+00	0.0000	9.1751+01	9.1751+01	3.9042-02
102	5.8158+00	5.3687+00	0.0000	9.0549+01	9.0549+01	5.4169-02
103	5.5781+00	5.3337+00	0.0000	8.9374+01	8.9374+01	6.9155-02
104	5.3402+00	5.2995+00	0.0000	8.8232+01	8.8232+01	8.4021-02
105	5.1021+00	5.2662+00	0.0000	8.7127+01	8.7127+01	9.8791-02

106	4.8637+00	5.2340+00	0.0000	8.6063+01	8.6063+01	1.1349-01
107	4.6249+00	5.2029+00	0.0000	8.5945+01	8.5945+01	1.2814-01
108	4.3857+00	5.1733+00	0.0000	8.4078+01	8.4078+01	1.4276-01
109	4.1459+00	5.1452+00	0.0000	8.3167+01	8.3167+01	1.5738-01
110	3.9055+00	5.1188+00	0.0000	8.2317+01	8.2317+01	1.7201-01
111	3.6644+00	5.0944+00	0.0000	8.1532+01	8.1532+01	1.8669-01
112	3.4225+00	5.0720+00	0.0000	8.0817+01	8.0817+01	2.0143-01
113	3.1796+00	5.0519+00	0.0000	8.0178+01	8.0178+01	2.1624-01
114	2.9359+00	5.0343+00	0.0000	7.9620+01	7.9620+01	2.3114-01
115	2.6910+00	5.0193+00	0.0000	7.9149+01	7.9149+01	2.4616-01
116	2.4449+00	5.0073+00	0.0000	7.8770+01	7.8770+01	2.6129-01
117	2.1975+00	4.9984+00	0.0000	7.8490+01	7.8490+01	2.7655-01
118	1.9486+00	4.9929+00	0.0000	7.8317+01	7.8317+01	2.9195-01
119	1.6980+00	4.9910+00	0.0000	7.8257+01	7.8257+01	1.4697+00
120	1.5265+00	4.9953+00	0.0000	7.8393+01	7.8393+01	1.4880+00
121	1.3638+00	5.0076+00	0.0000	7.8779+01	7.8779+01	1.5412+00
122	1.2099+00	5.0268+00	0.0000	7.9385+01	7.9385+01	1.6293+00
123	1.0645+00	5.0523+00	0.0000	8.0192+01	8.0192+01	1.7553+00
124	9.2755-01	5.0834+00	0.0000	8.1183+01	8.1183+01	1.9251+00

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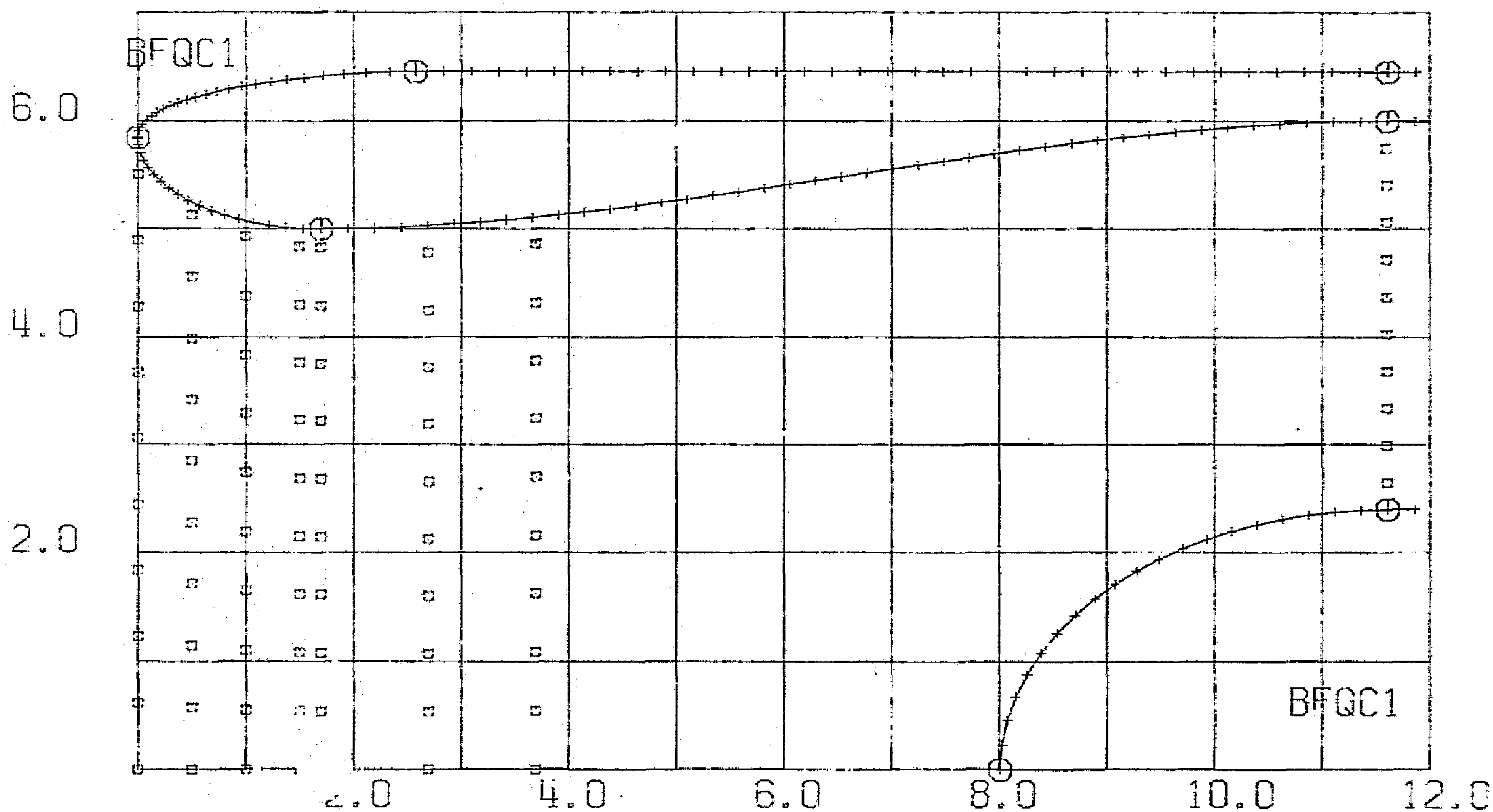
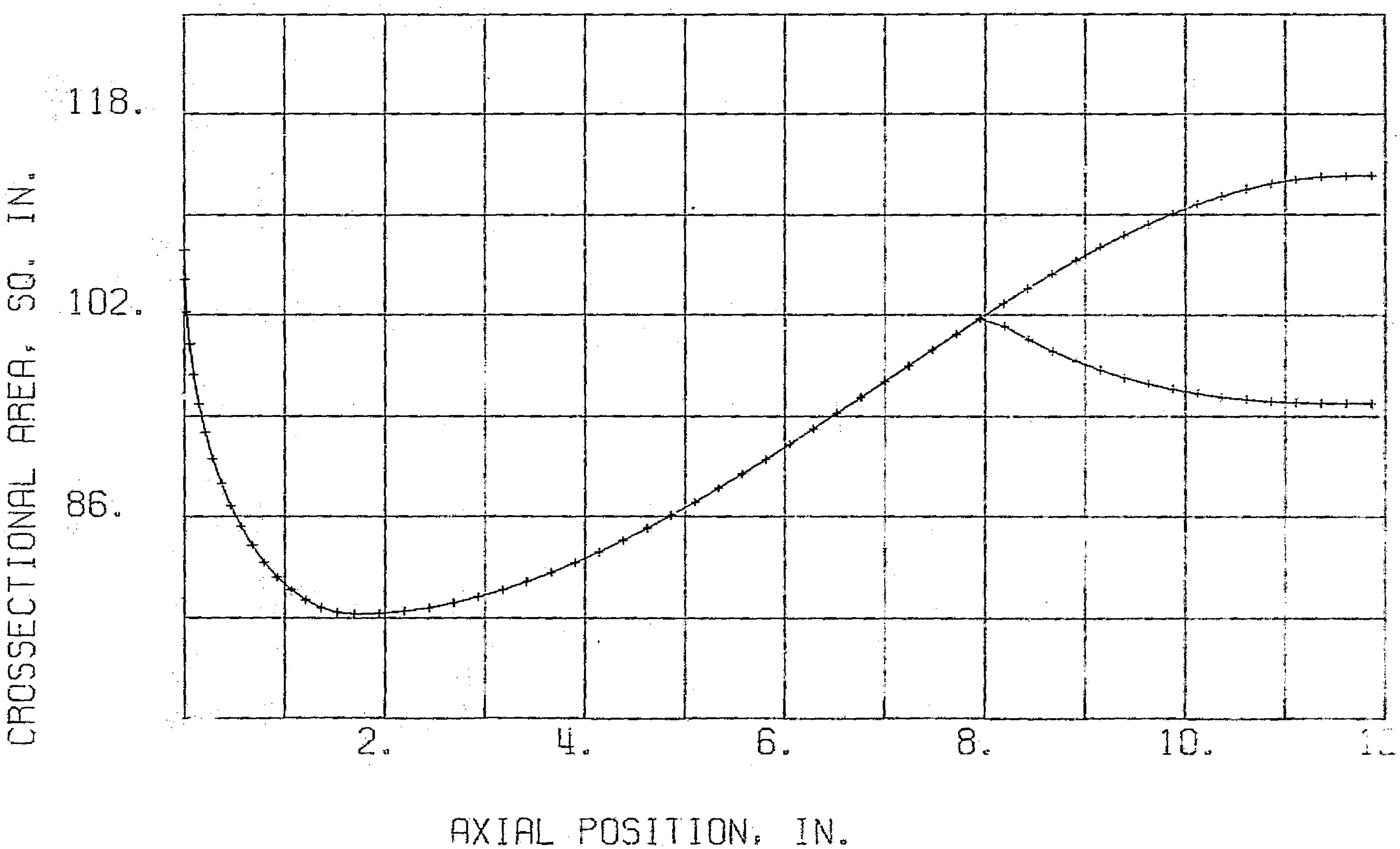
125	7.9897-01	5.1198+00	0.0000	8.2347+01	8.2347+01	2.1481+00
126	6.7865-01	5.1610+00	0.0000	8.3679+01	8.3679+01	2.4380+00
127	5.6654-01	5.2069+00	0.0000	8.5176+01	8.5176+01	2.8147+00
128	4.6268-01	5.2575+00	0.0000	8.6938+01	8.6838+01	3.3059+00
129	3.6912-01	5.3115+00	0.0000	8.8630+01	8.8630+01	3.9345+00
130	2.8454-01	5.3695+00	0.0000	9.0578+01	9.0578+01	4.7500+00
131	2.0945-01	5.4315+00	0.0000	9.2681+01	9.2681+01	5.8010+00
132	1.4455-01	5.4972+00	0.0000	9.4937+01	9.4937+01	7.1270+00
133	9.2773-02	5.5632+00	0.0000	9.7230+01	9.7230+01	8.6526+00
134	5.1724-02	5.6320+00	0.0000	9.9651+01	9.9651+01	1.0351+01
135	2.2269-02	5.7030+00	0.0000	1.0218+02	1.0218+02	1.2000+01
136	5.0333-03	5.7747+00	0.0000	1.0476+02	1.0476+02	1.3249+01
137	0.0000	5.8400+00	0.0000	1.0715+02	1.0715+02	0.0000

@FIN



TEST CASE RELLASE 2.0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86.
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2.
4.
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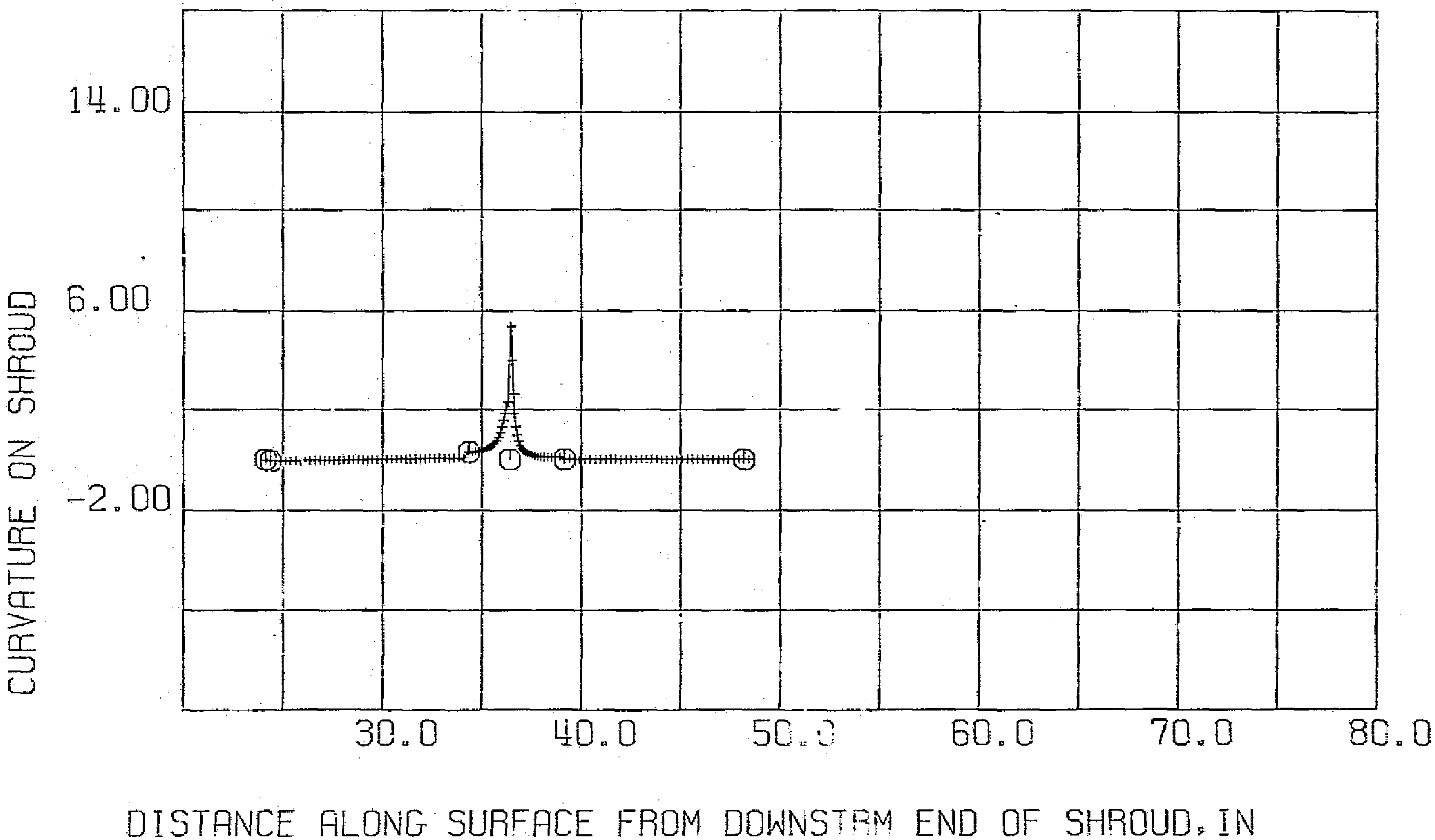
10.
AXIAL POSITION, IN.



14.00
6.00
-2.00
CURVATURE ON SHROUD
30.0
40.0
50.0
60.0
70.0
80.0
DISTANCE ALONG SURFACE FROM DOWNSTRM END OF SHROUD, IN

Program EOD

No input is shown for EOD since all EOD input is automatically generated in SCIRCL and passed on to EOD via mass storage file. No input cards need be punched.

```
POTENTIAL FLOW - EODF RELEASE 2                                        DATE  053177

                    DOUGLAS  AIRCRAFT COMPANY
                      LONG  BEACH  DIVISION

     PROGRAM EODF -- PARABOLIC AXISYMMETRIC AND CROSSFLOW

          ***** CASE CONTROL DATA *****

          TEST CASE RELEASE 2.0                        2-BODY   CASE NO.   BFQC1

     BODIES  =  2
     NNU     =  0
     CHORD   =   1.0000000
     MACH NO.=    .00000000
     TCNST   =    .0000000
     EPSLON  =    .3003000
     PSF NO. =

            SURFACE OF REVOLUTION
            CROSSFLOW
            OFF-BODY POINTS
            MATRIX SOLUTION BY TRIANGULARIZATION   (SOLVIT)
            STRIP VORTEX
            PUNCHED OUTPUT
            INPUT TAPE NO. FOR COORDINATES AND NON-UNIFORM FLOW ONLY =    5
```

POTENTIAL FLOW - FOOF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 49 MX = .0000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=3)
NEW VELOCITY FORMULAE ARE USED.

O N - B O D Y C O O R D I N A T E S

	UNTRANSFORMED X	Y	*** TRANSFORMED *** X	Y	X C.P.	Y C.P.	DELTA S	SUMOS	D ALPHA	CURVATURE
1	8.01100	.00000	8.01100	.00000						
					8.01521	.11510	.23041	.23041	.00000	-.61275
2	8.02751	.22962	8.02751	.22962						
					8.04826	.34427	.23306	.46081	-8.13602	-.59811
3	8.07693	.45720	8.07693	.45720						
					8.11287	.56686	.23084	.69388	-7.75906	-.56266
4	8.15586	.67395	8.15586	.67395						
					8.20576	.77867	.23232	.92472	-7.19054	-.51807
5	8.26185	.88020	8.26185	.88020						
					8.32409	.97894	.23347	1.15675	-6.60032	-.47048
6	8.39166	1.07411	8.39166	1.07411						
					8.46460	1.16622	.23502	1.39021	-6.00204	-.42430
7	8.54204	1.25459	8.54204	1.25459						
					8.62411	1.33974	.23654	1.62523	-5.43825	-.38237
8	8.70994	1.42109	8.70994	1.42109						
					8.79680	1.49671	.23033	1.86177	-4.85768	-.34576
9	8.88659	1.56881	8.88659	1.56881						
					8.98029	1.63834	.23337	2.09211	-4.37280	-.31452
10	9.07647	1.70440	9.07647	1.70440						
					9.17597	1.76769	.23586	2.32548	-4.03965	-.28809
11	9.27756	1.82758	9.27756	1.82758						
					9.38195	1.88460	.23791	2.56139	-3.74851	-.26580
12	9.48809	1.93830	9.48809	1.93830						
					9.59658	1.98910	.23960	2.79925	-3.49908	-.24717
13	9.70653	2.03666	9.70653	2.03666						
					9.81843	2.08132	.24099	3.03885	-3.28822	-.23175
14	9.93155	2.12283	9.93155	2.12283						
					10.04629	2.16145	.24214	3.27983	-3.11242	-.21912
15	10.16201	2.19701	10.16201	2.19701						
					10.27907	2.22970	.24309	3.52197	-2.96739	-.20890
16	10.39693	2.25940	10.39693	2.25940						
					10.51587	2.28626	.24388	3.76506	-2.85140	-.20080
17	10.63543	2.31020	10.63543	2.31020						
					10.75586	2.33131	.24453	4.00894	-2.76019	-.19458
18	10.87676	2.34955	10.87676	2.34955						
					10.99831	2.36499	.24507	4.25347	-2.69204	-.19006
19	11.12020	2.37759	11.12020	2.37759						
					11.24256	2.38740	.24552	4.49855	-2.64522	-.18712
20	11.36512	2.39440	11.36512	2.39440						
					11.48804	2.39818	.24596	4.74406	-2.61928	-.13009

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 49 MX = .0000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=0)
NEW VELOCITY FORMULAE ARE USED.

O N - B O D Y C O O R D I N A T E S

	UNTRANSFORMED X	***UNTRANSFORMED*** Y	*** TRANSFORMED *** X	*** TRANSFORMED *** Y
21	11.61100	2.40000	11.61100	2.40000
22	11.86609	2.40000	11.86609	2.40000
23	12.17220	2.40000	12.17220	2.40000
24	12.53954	2.40000	12.53954	2.40000
25	12.98033	2.40000	12.98033	2.40000
26	13.50929	2.40000	13.50929	2.40000
27	14.14404	2.40000	14.14404	2.40000
28	14.90575	2.40000	14.90575	2.40000
29	15.81979	2.40000	15.81979	2.40000
30	16.82880	2.40000	16.82880	2.40000
31	17.83781	2.40000	17.83781	2.40000
32	18.84682	2.40000	18.84682	2.40000
33	19.85583	2.40000	19.85583	2.40000
34	20.86484	2.40000	20.86484	2.40000
35	21.87385	2.40000	21.87385	2.40000
36	22.88286	2.40000	22.88286	2.40000
37	23.89187	2.40000	23.89187	2.40000
38	24.90088	2.40000	24.90088	2.40000
39	25.90989	2.40000	25.90989	2.40000
40	26.91890	2.40000	26.91890	2.40000

X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
11.73855	2.40000	.25509	4.99002	-1.30574	.00000
12.01915	2.40000	.30611	5.24511	.00000	.00000
12.35587	2.40000	.36733	5.55122	.00000	.00000
12.75994	2.40000	.44080	5.91855	.00000	.00000
13.24481	2.40000	.52896	6.35935	.00000	.00000
13.82667	2.40000	.63475	6.88831	.00000	.00000
14.52490	2.40000	.76170	7.52306	.00000	.00000
15.36277	2.40000	.91404	8.28476	.00000	.00000
16.32429	2.40000	1.00901	9.19881	.00000	.00000
17.33330	2.40000	1.00901	10.20782	.00000	.00000
18.34231	2.40000	1.00901	11.21683	.00000	.00000
19.35132	2.40000	1.00901	12.22584	.00000	.00000
20.36034	2.40000	1.00901	13.23485	.00000	.00000
21.36935	2.40000	1.00901	14.24386	.00000	.00000
22.37836	2.40000	1.00901	15.25287	.00000	.00000
23.38737	2.40000	1.00901	16.26188	.00000	.00000
24.39638	2.40000	1.00901	17.27089	.00000	.00000
25.40539	2.40000	1.00901	18.27990	.00000	.00000
26.41440	2.40000	1.00901	19.28891	.00000	.00000
27.42341	2.40000	1.00901	20.29792	.00000	.00000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 49 MX = .0000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=3)
NEW VELOCITY FORMULAE ARE USED.

O N - B O D Y C O O R D I N A T E S

	UNTRANSFORMED		*** TRANSFORMED ***							
	X	Y	X	Y	X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
41	27.92791	2.40000	27.92791	2.40000						
					28.43242	2.40000	1.00901	21.30693	.00000	.00000
42	28.93692	2.40000	28.93692	2.40000						
					29.44143	2.40000	1.00901	22.31594	.00000	.00000
43	29.94594	2.40000	29.94594	2.40000						
					30.45044	2.40000	1.00901	23.32495	.00000	.00000
44	30.95495	2.40000	33.95495	2.40000						
					31.45945	2.40000	1.00901	24.33396	.00000	.00000
45	31.96396	2.40000	31.96396	2.40000						
					32.46846	2.40000	1.00901	25.34297	.00000	.00000
46	32.97297	2.40000	32.97297	2.40000						
					33.47747	2.40000	1.00901	26.35198	.00000	.00000
47	33.98198	2.40000	33.98198	2.40000						
					34.48648	2.40000	1.00901	27.36099	.00000	.00000
48	34.99099	2.40000	34.99399	2.40000						
					35.49549	2.40000	1.00901	28.37001	.00000	.00000
49	36.00000	2.40000	36.00000	2.40000						

POTENTIAL FLOW - FOPF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.2 2-BODY

NN = 174 MX = .0000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=0)
NEW VELOCITY FORMULAE ARE USED.

O N - B O D Y C O O R D I N A T E S

	UNTRANSFORMED		*** TRANSFORMED ***							
	X	Y	X	Y	X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
1	36.00000	6.00000	36.00000	6.00000	35.49549	6.00000	1.00901	1.00901	.00000	.00000
2	34.99099	6.00000	34.99099	6.00000	34.48645	6.00000	1.00901	2.01802	.00000	.00000
3	33.98198	6.00000	33.98198	6.00000	33.47747	6.00000	1.00901	3.02704	.00000	.00000
4	32.97297	6.00000	32.97297	6.00000	32.46846	6.00000	1.00901	4.03605	.00000	.00000
5	31.96396	6.00000	31.96396	6.00000	31.45945	6.00000	1.00901	5.04506	.00000	.00000
6	30.95495	6.00000	30.95495	6.00000	30.45044	6.00000	1.00901	6.05407	.00000	.00000
7	29.94594	6.00000	29.94594	6.00000	29.44143	6.00000	1.00901	7.06308	.00000	.00000
8	28.93692	6.00000	28.93692	6.00000	28.43242	6.00000	1.00901	8.07209	.00000	.00000
9	27.92791	6.00000	27.92791	6.00000	27.42341	6.00000	1.00901	9.08110	.00000	.00000
10	26.91890	6.00000	26.91890	6.00000	26.41440	6.00000	1.00901	10.09011	.00000	.00000
11	25.90989	6.00000	25.90989	6.00000	25.40539	6.00000	1.00901	11.09912	.00000	.00000
12	24.90088	6.00000	24.90088	6.00000	24.39638	6.00000	1.00901	12.10813	.00000	.00000
13	23.89187	6.00000	23.89187	6.00000	23.38737	6.00000	1.00901	13.11714	.00000	.00000
14	22.88286	6.00000	22.88286	6.00000	22.37836	6.00000	1.00901	14.12615	.00000	.00000
15	21.87385	6.00000	21.87385	6.00000	21.36935	6.00000	1.00901	15.13516	.00000	.00000
16	20.86484	6.00000	20.86484	6.00000	20.36034	6.00000	1.00901	16.14417	.00000	.00000
17	19.85583	6.00000	19.85583	6.00000	19.35132	6.00000	1.00901	17.15318	.00000	.00000
18	18.84682	6.00000	18.84682	6.00000	18.34231	6.00000	1.00901	18.16219	.00000	.00000
19	17.83781	6.00000	17.83781	6.00000	17.33330	6.00000	1.00901	19.17120	.00000	.00000
20	16.82880	6.00000	16.82880	6.00000	16.32429	6.00000	1.00901	20.18021	.00000	.00000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 174 MX = .0000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=1)
NEW VELOCITY FORMULAE ARE USED.

	ON - BODY	COORDINATES								
	UNTRANSFORMED		*** TRANSFORMED ***							
	X	Y	X	Y	X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
21	15.81979	6.00000	15.81979	6.00000						
					15.36277	6.00000	.91404	21.16922	.00000	.00000
22	14.90575	6.00000	14.90575	6.00000						
					14.52490	6.00000	.76170	22.10327	.00000	.00000
23	14.14404	6.00000	14.14404	6.00000						
					13.82667	6.00000	.63475	22.86497	.00000	.00000
24	13.50929	6.00000	13.50929	6.00000						
					13.24481	6.00000	.52896	23.49972	.00000	.00000
25	12.98033	6.00000	12.98033	6.00000						
					12.75994	6.00000	.44080	24.02868	.00000	.00000
26	12.53954	6.00000	12.53954	6.00000						
					12.35587	6.00000	.36733	24.46948	.00000	.00000
27	12.17220	6.00000	12.17220	6.00000						
					12.01915	6.00000	.30611	24.83681	.00000	.00000
28	11.86609	6.00000	11.86609	6.00000						
					11.73855	6.00000	.25509	25.14292	.00000	.00000
29	11.61100	6.00000	11.61100	6.00000						
					11.48493	5.99937	.25215	25.39801	-359.56256	.04195
30	11.35886	5.99807	11.35886	5.99807						
					11.23364	5.99572	.25048	25.65016	.84176	.05685
31	11.10845	5.99248	11.10845	5.99248						
					10.98402	5.98840	.24899	25.90064	.79118	.05369
32	10.85962	5.98349	10.85962	5.98349						
					10.73591	5.97780	.24768	26.14963	.74172	.05053
33	10.61224	5.97134	10.61224	5.97134						
					10.48919	5.96416	.24652	26.39731	.69335	.04738
34	10.36618	5.95626	10.36618	5.95626						
					10.24373	5.94771	.24550	26.64383	.64599	.04424
35	10.12133	5.93849	10.12133	5.93849						
					9.99943	5.92867	.24460	26.88932	.59962	.04113
36	9.87757	5.91823	9.87757	5.91823						
					9.75616	5.90724	.24382	27.13393	.55412	.03803
37	9.63480	5.89569	9.63480	5.89569						
					9.51383	5.88363	.24313	27.37774	.50954	.03497
38	9.39292	5.87106	9.39292	5.87106						
					9.27235	5.85802	.24254	27.62087	.46578	.03193
39	9.15184	5.84452	9.15184	5.84452						
					9.03162	5.83061	.24203	27.86341	.42268	.02891
40	8.91146	5.81627	8.91146	5.81627						
					8.79155	5.80156	.24160	28.10545	.38338	.02592

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 174		MX =	.0000000	MY =	.0000000
THETA =	.0000000	ADDX =	.0000000	ADDY =	.0000000
XE =	.00000[illegible]0	YE =	.0000000		

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=0)
NEW VELOCITY FORMULAE ARE USED.

	O N - B O D Y	C O O R D I N A T E S								
	UNTRANSFORMED		*** TRANSFORMED ***							
	X	Y	X	Y	X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
41	8.67170	5.78646	8.67170	5.78646	8.55237	5.77106	.24124	28.34705	.33854	.02296
42	8.43248	5.75531	8.43248	5.75531	8.31307	5.73928	.24095	28.58830	.29742	.02001
43	8.19371	5.72295	8.19371	5.72295	8.07450	5.70637	.24072	28.82924	.25665	.01708
44	7.95532	5.68955	7.95532	5.68955	7.83626	5.67251	.24054	29.06996	.21636	.0[illegible]417
45	7.71724	5.65527	7.71724	5.65527	7.59829	5.63785	.24042	29.31050	.17640	.01127
46	7.47938	5.62028	7.47938	5.62028	7.36351	5.60256	.24035	29.55092	.13668	.00837
47	7.24167	5.58473	7.24167	5.58473	7.12285	5.56679	.24033	29.79127	.09718	.00544
48	7.00404	5.54878	7.00404	5.54878	6.88523	5.53070	.24036	30.03160	.0[illegible]784	.00237
49	6.76642	5.51259	6.76642	5.51259	6.64758	5.49445	.24044	30.27196	.01848	.00000
50	6.52874	5.47630	6.52874	5.47630	6.40990	5.45819	.24042	30.51240	-.02078	-.00257
51	6.29106	5.44011	6.29106	5.44011	6.17225	5.42211	.24032	30.75282	-.06010	-.00562
52	6.05344	5.40418	6.05344	5.40418	5.93463	5.38637	.24027	30.99314	-.09951	-.00854
53	5.81581	5.36867	5.81581	5.36867	5.69696	5.35112	.24027	31.23341	-.13890	-.01144
54	5.57810	5.33374	5.57810	5.33374	5.45918	5.31654	.24032	31.47368	-.17852	-.01434
55	5.34023	5.29954	5.34023	5.29954	5.22119	5.28277	.24042	31.71399	-.21837	-.01725
56	5.10212	5.26624	5.10212	5.26624	4.98294	5.24996	.24058	31.95441	-.25849	-.02017
57	4.86372	5.23398	4.86372	5.23398	4.74435	5.21830	.24080	32.19499	-.29910	-.02311
58	4.62493	5.20295	4.62493	5.20295	4.50533	5.18793	.24108	32.43579	-.33997	-.02607
59	4.38568	5.17329	4.38568	5.17329	4.26581	5.15903	.24143	32.67686	-.38152	-.02906
60	4.14589	5.14519	4.14589	5.14519	4.02571	5.13177	.24185	32.91829	-.42353	-.03206

POTENTIAL FLOW - EODF RELEASE 2 . DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 174 . MX = .0000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=0)
NEW VELOCITY FORMULAE ARE USED.

	O N - B O D Y	C O O R D I N A T E S								
	UNTRANSFORMED		*** TRANSFORMED ***							
	X	Y	X	Y	X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
61	3.90548	5.11882	3.90548	5.11882						
					3.78495	5.10633	.24236	33.16015	-.46619	-.03510
62	3.66437	5.09435	3.66437	5.09435						
					3.54343	5.08289	.24295	33.40250	-.50957	-.03815
63	3.42245	5.07198	3.42245	5.07198						
					3.30107	5.06163	.24364	33.64545	-.55362	-.04123
64	3.17965	5.05188	3.17965	5.05188						
					3.05777	5.04275	.24443	33.88909	-.59854	-.04434
65	2.93585	5.03427	2.93585	5.03427						
					2.81343	5.02645	.24534	34.13352	-.64427	-.04746
66	2.69097	5.01934	2.69097	5.01934						
					2.56794	5.01295	.24638	34.37886	-.69095	-.05059
67	2.44488	5.00732	2.44488	5.00732						
					2.32119	5.0024[illegible]	.24757	34.62524	-.73642	-.05374
68	2.19748	4.99843	2.19748	4.99843						
					2.07306	4.99522	.24891	34.87280	-.78702	-.05688
69	1.94863	4.99290	1.94863	4.99290						
					1.82332	4.99120	.25064	35.12171	-.83685	-.09546
70	1.69800	4.99100	1.69800	4.99100						
					1.61224	4.99238	.17154	35.37236	358.11524	-.21562
71	1.52653	4.99534	1.52653	4.99534						
					1.44511	5.00047	.16317	35.54389	-2.86063	-.30320
72	1.36384	5.00760	1.36384	5.00760						
					1.28673	5.01628	.15519	35.70706	-2.81035	-.31620
73	1.20986	5.02684	1.20986	5.02684						
					1.13701	5.03867	.14762	35.86225	-2.81457	-.33590
74	1.06448	5.05231	1.06448	5.05231						
					.99582	5.06699	.14043	36.00986	-2.86954	-.36306
75	.92755	5.08343	.92755	5.08343						
					.86302	5.10074	.13363	36.15029	-2.97599	-.39898
76	.79897	5.11976	.79897	5.11976						
					.73852	5.13953	.12721	36.28393	-3.13825	-.44565
77	.67865	5.16101	.67865	5.16101						
					.62224	5.18312	.12118	36.41114	-3.36526	-.50594
78	.56654	5.20695	.56654	5.20695						
					.51419	5.23135	.11553	36.53231	-3.67042	-.58351
79	.46268	5.25750	.46268	5.25750						
					.41540	5.28363	.10804	36.64785	-4.02910	-.62337
80	.36912	5.31149	.36912	5.31149						
					.32623	5.33963	.10261	36.75589	-4.48014	-.81072

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 174 MX = .0000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=0)
NEW VELOCITY FORMULAE ARE USED.

O N - B O D Y C O O R D I N A T E S

	UNTRANSFORMED		*** TRANSFORMED ***							
	X	Y	X	Y	X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
81	.28454	5.36954	.28454	5.36954						
					.24626	5.39964	.09741	36.85850	-5.07305	-.97290
82	.20945	5.43152	.20945	5.43152						
					.17511	5.46349	.09239	36.95591	-5.81296	-1.17583
83	.14455	5.49722	.14455	5.49722						
					.11768	5.52944	.08393	37.04830	-6.53213	-1.41778
84	.09277	5.56321	.09277	5.56321						
					.07108	5.59693	.08021	37.13223	-7.30877	-1.68826
85	.05172	5.63205	.05172	5.63205						
					.03566	5.66694	.07685	37.21244	-8.25017	-1.96018
86	.02227	5.70295	.02227	5.70295						
					.01221	5.73847	.07385	37.28929	-9.04699	-2.18559
87	.00503	5.77468	.00503	5.77468						
					.00103	5.80722	.06561	37.36314	-9.10564	-2.77013
88	.00000	5.84000	.00000	5.84000						
					.00270	5.87436	.06900	37.42874	-12.97548	-4.14121
89	.01025	5.90800	.01025	5.90800						
					.02326	5.93735	.06428	37.49774	-19.47916	-4.52077
90	.04037	5.96453	.04037	5.96453						
					.05969	5.98791	.06070	37.56201	-14.36329	-3.27948
91	.08124	6.00927	.08124	6.00927						
					.10216	6.02710	.05498	37.62272	-8.88272	-2.20926
92	.12412	6.04363	.12412	6.04363						
					.14919	6.06054	.06049	37.67770	-6.02210	-1.53140
93	.17501	6.07628	.17501	6.07628						
					.20383	6.09229	.06594	37.73818	-4.56618	-1.09735
94	.23321	6.10725	.23321	6.10725						
					.26558	6.12246	.07153	37.80412	-3.68141	-.80732
95	.29837	6.13672	.29837	6.13672						
					.33424	6.15124	.07739	37.87565	-2.97454	-.61004
96	.37044	6.16491	.37044	6.16491						
					.40985	6.17884	.08360	37.95304	-2.46141	-.47239
97	.44952	6.19198	.44952	6.19198						
					.49259	6.20540	.09022	38.03663	-2.08174	-.37385
98	.53588	6.21809	.53588	6.21809						
					.58278	6.23104	.09732	38.12686	-1.79599	-.30164
99	.62987	6.24331	.62987	6.24331						
					.68083	6.25584	.10494	38.22418	-1.57711	-.24763
100	.73194	6.26771	.73194	6.26771						
					.78719	6.27983	.11313	38.32912	-1.40751	-.20656

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN =	174	MX =	.0000000	MY =	.0000000
THETA =	.0000000	ADDX =	.3000000	ADDY =	.0000000
XE =	.0000000	YE =	.0000000		

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=0)
NEW VELOCITY FORMULAE ARE USED.

	O N - B O D Y	C O O R D I N A T E S								
	UNTRANSFORMED		*** TRANSFORMED ***							
	X	Y	X	Y	X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
101	.84258	6.29130	.84258	6.29130						
					.90242	6.30301	.12194	38.44226	-1.27542	-.17491
102	.96238	6.31407	.96238	6.31407						
					1.02712	6.32534	.13143	38.56420	-1.17266	-.15030
103	1.09197	6.33597	1.09197	6.33597						
					1.16196	6.34676	.14163	38.69563	-1.09393	-.13110
104	1.23204	6.35689	1.23204	6.35689						
					1.30767	6.36713	.15263	38.83726	-1.03615	-.11618
105	1.38338	6.37671	1.38338	6.37671						
					1.46505	6.38631	.16446	38.98989	-.99750	-.10480
106	1.54679	6.39521	1.54679	6.39521						
					1.63496	6.40406	.17721	39.15435	-.97892	-.09655
107	1.72319	6.41215	1.72319	6.41215						
					1.81834	6.42005	.19095	39.33156	-.98315	-.09142
108	1.91355	6.42713	1.91355	6.42713						
					2.01620	6.43385	.20574	39.52251	-1.01899	-.09013
109	2.11891	6.43962	2.11891	6.43962						
					2.22963	6.44480	.22169	39.72825	-1.10949	-.09678
110	2.34040	6.44879	2.34040	6.44879						
					2.46069	6.45151	.24064	39.94994	-1.36908	-.08516
111	2.58100	6.45300	2.58100	6.45300						
					2.71000	6.45300	.25800	40.19058	-1.00222	.00000
112	2.83900	6.45300	2.83900	6.45300						
					2.96800	6.45300	.25800	40.44858	.00000	.00000
113	3.09700	6.45300	3.09700	6.45300						
					3.22600	6.45300	.25800	40.70658	.00000	.00000
114	3.35500	6.45300	3.35500	6.45300						
					3.48400	6.45300	.25800	40.96458	.00000	.00000
115	3.61300	6.45300	3.61300	6.45300						
					3.74200	6.45300	.25800	41.22258	.00000	.00000
116	3.87100	6.45300	3.87100	6.45300						
					4.00000	6.45300	.25800	41.48058	.00000	.00000
117	4.12900	6.45300	4.12900	6.45300						
					4.25800	6.45300	.25800	41.73858	.00000	.00000
118	4.38700	6.45300	4.38700	6.45300						
					4.51600	6.45300	.25800	41.99658	.00000	.00000
119	4.64500	6.45300	4.64500	6.45300						
					4.77400	6.45300	.25800	42.25458	.00000	.00000
120	4.90300	6.45300	4.90300	6.45300						
					5.03200	6.45300	.25800	42.51258	.00000	.00000

POTENTIAL FLOW - FODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 174 MX = .0000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XF = .0000000 YE = .0000000

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=3)
NEW VELOCITY FORMULAE ARE USED.

O N - B O D Y C O O R D I N A T E S

	UNTRANSFORMED		*** TRANSFORMED ***							
	X	Y	X	Y	X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
121	5.16100	6.45300	5.16100	6.45300						
					5.29000	6.45300	.25800	42.77058	.00000	.00000
122	5.41900	6.45300	5.41900	6.45300						
					5.54800	6.45300	.25800	43.02858	.00000	.00000
123	5.67700	6.45300	5.67700	6.45300						
					5.80600	6.45300	.25800	43.28658	.00000	.00000
124	5.93500	6.45300	5.93500	6.45300						
					6.06400	6.45300	.25800	43.54458	.00000	.00000
125	6.19300	6.45300	6.19300	6.45300						
					6.32200	6.45300	.25800	43.80258	.00000	.00000
126	6.45100	6.45300	6.45100	6.45300						
					6.58000	6.45300	.25800	44.06058	.00000	.00000
127	6.70900	6.45300	6.70900	6.45300						
					6.83800	6.45300	.25800	44.31857	.00000	.00000
128	6.96700	6.45300	6.96700	6.45300						
					7.09600	6.45300	.25800	44.57657	.00000	.00000
129	7.22500	6.45300	7.22500	6.45300						
					7.35400	6.45300	.25800	44.83457	.00000	.00000
130	7.48300	6.45300	7.48300	6.45300						
					7.61200	6.45300	.25800	45.09257	.00000	.00000
131	7.74100	6.45300	7.74100	6.45300						
					7.87000	6.45300	.25800	45.35057	.00000	.00000
132	7.99900	6.45300	7.99900	6.45300						
					8.12800	6.45300	.25800	45.60857	.00000	.00000
133	8.25700	6.45300	8.25700	6.45300						
					8.38600	6.45300	.25800	45.86657	.00000	.00000
134	8.51500	6.45300	8.51500	6.45300						
					8.64400	6.45300	.25800	46.12457	.00000	.00000
135	8.77300	6.45300	8.77300	6.45300						
					8.90200	6.45300	.25800	46.38257	.00000	.00000
136	9.03100	6.45300	9.03100	6.45300						
					9.16000	6.45300	.25800	46.64057	.00000	.00000
137	9.28900	6.45300	9.28900	6.45300						
					9.41800	6.45300	.25800	46.89857	.00000	.00000
138	9.54700	6.45300	9.54700	6.45300						
					9.67600	6.45300	.25800	47.15657	.00000	.00000
139	9.80500	6.45300	9.80500	6.45300						
					9.93400	6.45300	.25800	47.41457	.00000	.00000
140	10.06300	6.45300	10.06300	6.45300						
					10.19200	6.45300	.25800	47.67257	.00000	.00000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 174 MX = .0000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=0)
NEW VELOCITY FORMULAE ARE USED.

O N - B O D Y C O O R D I N A T E S

	UNTRANSFORMED		*** TRANSFORMED ***							
	X	Y	X	Y	X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
141	10.32100	6.45300	10.32100	6.45300						
					10.45300	6.45300	.25800	47.93057	.00000	.00000
142	10.57900	6.45300	10.57900	6.45300						
					10.70800	6.45300	.25800	48.18857	.00000	.00000
143	10.83700	6.45300	10.83700	6.45300						
					10.96600	6.45300	.25800	48.44657	.00000	.00000
144	11.09500	6.45300	11.09500	6.45300						
					11.22400	6.45300	.25800	48.70457	.00000	.00000
145	11.35300	6.45300	11.35300	6.45300						
					11.48200	6.45300	.25800	48.96257	.00000	.00000
146	11.61100	6.45300	11.61100	6.45300						
					11.74000	6.45300	.25800	49.22057	.00000	.00000
147	11.86900	6.45300	11.66900	6.45300						
					12.02360	6.45300	.30969	49.47857	.00000	.00000
148	12.17860	6.45300	12.17860	6.45300						
					12.36436	6.45300	.37152	49.78817	.00000	.00000
149	12.55012	6.45300	12.55012	6.45300						
					12.77303	6.45300	.44582	50.15969	.00000	.00000
150	12.99594	6.45300	12.99594	6.45300						
					13.26344	6.45300	.53499	50.60552	.00000	.00000
151	13.53093	6.45300	13.53093	6.45300						
					13.85193	6.45300	.64199	51.14051	.00000	.00000
152	14.17292	6.45300	14.17292	6.45300						
					14.55811	6.45300	.77038	51.78249	.00000	.00000
153	14.94330	6.45300	14.94330	6.45300						
					15.40553	6.45300	.92446	52.55288	.00000	.00000
154	15.86776	6.45300	15.86776	6.45300						
					16.37107	6.45300	1.00661	53.47734	.00000	.00000
155	16.87438	6.45300	16.87438	6.45300						
					17.37768	6.45300	1.00661	54.48395	.00000	.00000
156	17.88099	6.45300	17.88099	6.45300						
					18.38429	6.45300	1.00661	55.49056	.00000	.00000
157	18.88760	6.45300	18.88762	6.45300						
					19.39090	6.45300	1.00661	56.49717	.00000	.00000
158	19.89421	6.45300	19.89421	6.45300						
					20.39752	6.45300	1.00661	57.50378	.00000	.00000
159	20.90082	6.45300	20.90082	6.45300						
					21.40413	6.45300	1.00661	58.51039	.00000	.00000
160	21.90743	6.45300	21.90743	6.45300						
					22.41074	6.45300	1.00661	59.51701	.00000	.00000

POTENTIAL FLOW - CODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 174 MX = .0000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=0)
NEW VELOCITY FORMULAE ARE USED.

	O N - B O D Y	C O O R D I N A T E S								
	UNTRANSFORMED		*** TRANSFORMED ***							
	X	Y	X	Y	X C.P.	Y C.P.	DELTA S	SUMDS	D ALPHA	CURVATURE
161	22.91405	6.45300	22.91405	6.45300						
					23.41735	6.45300	1.00661	60.52362	.00000	.00000
162	23.92066	6.45300	23.92066	6.45300						
					24.42396	6.45300	1.00661	61.53023	.00000	.00000
163	24.92727	6.45300	24.92727	6.45300						
					25.43058	6.45300	1.00661	62.53684	.00000	.00000
164	25.93388	6.45300	25.93388	6.45300						
					26.43719	6.45300	1.00661	63.54345	.00000	.00000
165	26.94049	6.45300	26.94049	6.45300						
					27.44380	6.45300	1.00661	64.55006	.00000	.00000
166	27.94710	6.45300	27.94710	6.45300						
					28.45041	6.45300	1.00661	65.55668	.00000	.00000
167	28.95372	6.45300	28.95372	6.45300						
					29.45702	6.45300	1.00661	66.56329	.00000	.00000
168	29.96033	6.45300	29.96033	6.45300						
					30.46363	6.45300	1.00661	67.56990	.00000	.00000
169	30.96694	6.45300	30.96694	6.45300						
					31.47025	6.45300	1.00661	68.57651	.00000	.00000
170	31.97355	6.45300	31.97355	6.45300						
					32.47686	6.45300	1.00661	69.58312	.00000	.00000
171	32.98016	6.45300	32.98016	6.45300						
					33.48347	6.45300	1.00661	70.58973	.00000	.00000
172	33.98678	6.45300	33.98678	6.45300						
					34.49008	6.45300	1.00661	71.59635	.00000	.00000
173	34.99339	6.45300	34.99339	6.45300						
					35.49669	6.45300	1.00661	72.60296	.00000	.00000
174	36.00000	6.45300	36.00000	6.45300						

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN =	90	MX =	.0000000	MY =	.0000000
THETA =	.0000000	ADDX =	.0000000	ADDY =	.0000000
XE =	.0000000	YE =	.0000000		

O F F - B O D Y   C O O R D I N A T E S

	UNTRANSFORMED X	Y	*** TRANSFORMED *** X	Y
1	-.50000	.00000	-.50000	.00000
2	-.50000	.72222	-.50000	.72222
3	-.50000	1.44444	-.50000	1.44444
4	-.50000	2.16667	-.50000	2.16667
5	-.50000	2.88889	-.50000	2.88889
6	-.50000	3.61111	-.50000	3.61111
7	-.50000	4.33333	-.50000	4.33333
8	-.50000	5.05556	-.50000	5.05556
9	-.50000	5.77778	-.50000	5.77778
10	-.50000	6.50000	-.50000	6.50000
11	.00000	.00000	.00000	.00000
12	.00000	.61111	.00000	.61111
13	.00000	1.22222	.00000	1.22222
14	.00000	1.83333	.00000	1.83333
15	.00000	2.44444	.00000	2.44444
16	.00000	3.05556	.00000	3.05556
17	.00000	3.66667	.00000	3.66667
18	.00000	4.27778	.00000	4.27778
19	.00000	4.88889	.00000	4.88889
20	.00000	5.50000	.00000	5.50000
21	.50000	.00000	.50000	.00000
22	.50000	.56922	.50000	.56922
23	.50000	1.13843	.50000	1.13843
24	.50000	1.70765	.50000	1.70765
25	.50000	2.27686	.50000	2.27686
26	.50000	2.84608	.50000	2.84608
27	.50000	3.41530	.50000	3.41530
28	.50000	3.98451	.50000	3.98451
29	.50000	4.55373	.50000	4.55373
30	.50000	5.12294	.50000	5.12294
31	1.00000	.00000	1.00000	.00000
32	1.00000	.54730	1.00000	.54730
33	1.00000	1.09460	1.00000	1.09460
34	1.00000	1.64189	1.00000	1.64189
35	1.00000	2.18919	1.00000	2.18919
36	1.00000	2.73649	1.00000	2.73649
37	1.00000	3.28379	1.00000	3.28379
38	1.00000	3.83109	1.00000	3.83109
39	1.00000	4.37838	1.00000	4.37838
40	1.00000	4.92568	1.00000	4.92568

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 90 MX = .3000000 MY = .0000000
THETA = .0000000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

O F F - B O D Y   C O O R D I N A T E S

	UNTRANSFORMED		*** TRANSFORMED ***	
	X	Y	X	Y
41	1.50000	.00000	1.50000	.00000
42	1.50000	.53707	1.50000	.53707
43	1.50000	1.07414	1.50000	1.07414
44	1.50000	1.61122	1.50000	1.61122
45	1.50000	2.14829	1.50000	2.14829
46	1.50000	2.68536	1.50000	2.68536
47	1.50000	3.22243	1.50000	3.22243
48	1.50000	3.75951	1.50000	3.75951
49	1.50000	4.29658	1.50000	4.29658
50	1.50000	4.83365	1.50000	4.83365
51	1.69800	.00000	1.69800	.00000
52	1.69800	.53550	1.69800	.53550
53	1.69800	1.07099	1.69800	1.07099
54	1.69800	1.60649	1.69800	1.60649
55	1.69800	2.14199	1.69800	2.14199
56	1.69800	2.67749	1.69800	2.67749
57	1.69800	3.21298	1.69800	3.21298
58	1.69800	3.74848	1.69800	3.74848
59	1.69800	4.28398	1.69800	4.28398
60	1.69800	4.81947	1.69800	4.81947
61	2.69800	.00000	2.69800	.00000
62	2.69800	.53049	2.69800	.53049
63	2.69800	1.06098	2.69800	1.06098
64	2.69800	1.59146	2.69800	1.59146
65	2.69800	2.12195	2.69800	2.12195
66	2.69800	2.65244	2.69800	2.65244
67	2.69800	3.18293	2.69800	3.18293
68	2.69800	3.71342	2.69800	3.71342
69	2.69800	4.24391	2.69800	4.24391
70	2.69800	4.77439	2.69800	4.77439
71	3.69800	.00000	3.69800	.00000
72	3.69800	.53948	3.69800	.53948
73	3.69800	1.07895	3.69800	1.07895
74	3.69800	1.61843	3.69800	1.61843
75	3.69800	2.15791	3.69800	2.15791
76	3.69800	2.69738	3.69800	2.69738
77	3.69800	3.23686	3.69800	3.23686
78	3.69800	3.77634	3.69800	3.77634
79	3.69800	4.31581	3.69800	4.31581
80	3.69800	4.85529	3.69800	4.85529

POTENTIAL FLOW - FOOF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY

NN = 90 MX = .0000000 MY = .0000000
THETA = .0500000 ADDX = .0000000 ADDY = .0000000
XE = .0000000 YE = .0000000

O F F - B O D Y C O O R D I N A T E S

	UNTRANSFORMED		*** TRANSFORMED ***	
	X	Y	X	Y
81	11.60000	2.64581	11.60000	2.64581
82	11.60000	2.99048	11.60000	2.99048
83	11.60000	3.33514	11.60000	3.33514
84	11.60000	3.67981	11.60000	3.67981
85	11.60000	4.02448	11.60000	4.02448
86	11.60000	4.36914	11.60000	4.36914
87	11.60000	4.71381	11.60000	4.71381
88	11.60000	5.05847	11.60000	5.05847
89	11.60000	5.40314	11.60000	5.40314
90	11.60000	5.74781	11.60000	5.74781

A REWIND WAS ATTEMPTED ON A SYMBIONT DEVICE - IGNORED
I/O CALLED AT SEQUENCE NUMBER 000132 OF MATRIX

```
POTENTIAL FLOW - EODF RELEASE 2                                                                DATE  053177

 MATRIX FORMATION TOOK          .000 SECONDS
 (THE NUMBER OF TIMES THAT SMALL ELEMENT FORMULAE WERE USED WAS      0.)

THE  221 X  221 MATRIX WITH   3 RIGHT SIDES WAS SOLVED DIRECTLY IN     .300 MINUTES.

THE  221 X  221 MATRIX WITH   1 RIGHT SIDES WAS SOLVED DIRECTLY IN     .000 MINUTES.
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POTENTIAL FLOW - EODF RE EASE 2 DATE 053177

MATRIX PREPARATION AND ALL SOLUTIONS TOOK .303 SECONDS

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. 8FOC1 PSF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
1	8.0110000	.2000000							
	8.0152385	.1151024	.0977351	.9954479	.99742	.07174	-.1044161	.0000001	.0000000
2	8.0275149	.2296225							
	8.0482578	.3442699	.2877792	.9171831	.97723	.21217	-.1019876	.0000001	.0000000
3	8.0769252	.4571968							
	8.1128740	.5668563	.4625719	.7860272	.93964	.34216	-.0975355	.0000001	.0000000
4	8.1558563	.6739545							
	8.2057551	.7786682	.6150995	.6216526	.88942	.45729	-.0915971	.0000000	.0000000
5	8.2618482	.8801982							
	8.3240924	.9789353	.7491793	.4461972	.83099	.55629	-.0847048	.0000001	.0000000
6	8.3916585	1.0741090							
	8.4645996	1.1662225	.8503139	.2769663	.76826	.64013	-.0773369	.0000001	.0000000
7	8.5420380	1.2545890							
	8.6241082	1.3397385	.9356762	.1245101	.70414	.72006	-.0698476	.0000001	.0000000
8	8.7099422	1.4210927							
	8.7967980	1.4967089	1.0021597	-.0043241	.64148	.76714	-.0625865	.0000001	.0000000
9	8.8865939	1.5688088							
	8.9802898	1.6383442	1.0535091	-.1098814	.58112	.81382	-.0556617	.0000001	.0000000
10	9.0764732	1.7043962							
	9.1759719	1.7676933	1.0933995	-.1955225	.52235	.85273	-.0489899	.0000000	.0000000
11	9.2775625	1.8275751							
	9.3819519	1.8846013	1.1236995	-.2627005	.46546	.88506	-.0426115	.0000000	.0000000
12	9.4880913	1.9382993							
	9.5965809	1.9890973	1.1460566	-.3134456	.41060	.91182	-.0365291	.0000001	.0000000
13	9.7065265	2.0366619							
	9.8184350	2.0813177	1.1618156	-.3498154	.35762	.93387	-.0307237	.0000001	.0000000
14	9.9315463	2.1228321							
	10.0462868	2.1614498	1.1720145	-.3736181	.30639	.95191	-.0251600	.0000000	.0000000
15	10.1620110	2.1970111							
	10.2790741	2.2296982	1.1773832	-.3862311	.25669	.96649	-.0197937	.0000001	.0000000
16	10.3969290	2.2594033							
	10.5158712	2.2862603	1.1783253	-.3884506	.20830	.97807	-.0145713	.0000000	.0000000
17	10.6354350	2.3101971							
	10.7558620	2.3313097	1.1748614	-.3802993	.16095	.98696	-.0094334	.0000001	.0000000
18	10.8767570	2.3495523							
	10.9983147	2.3649888	1.1654785	-.3655721	.11442	.99343	-.0043125	-.0000000	.0000000
19	11.1201999	2.3775911							
	11.2425621	2.3873996	1.1517930	-.3266272	.06845	.99765	.0008714	-.0000000	.0000000
20	11.3651180	2.3943955							
	11.4880365	2.3981811	1.1216049	-.2579975	.02279	.99974	.0062710	.0000000	.0000000
21	11.6109999	2.4000000							
	11.7385459	2.4000000	1.0831007	-.1666174	.00000	1.00000	.0081443	.0000000	.0000000
22	11.8660920	2.4000000							
	12.0191474	2.4000000	1.0493549	-.0990481	.00000	1.00000	.0064096	.0000000	.0000000

POTENTIAL FLOW - CODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. PFOC1 SCF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
23	12.1722029	2.4000000							
	12.3558694	2.4000000	1.0299242	-.0607438	.00000	1.00000	.0048699	.0000000	.0000000
24	12.5395360	2.4000000							
	12.7599355	2.4000000	1.0163234	-.0329133	.00000	1.00000	.0035282	.0000000	.0000000
25	12.9803350	2.4000000							
	13.2448145	2.4000000	1.0063651	-.0127707	.00000	1.00000	.0024342	.0000000	.0000000
26	13.5092940	2.4000000							
	13.8266695	2.4000000	.9993673	.0012649	.00000	1.00000	.0015157	-.0000000	.0000000
27	14.1440450	2.4000000							
	14.5248954	2.4000000	.9947837	.0104054	.00000	1.00000	.0008668	-.0000000	.0000000
28	14.9057460	2.4000000							
	15.3627670	2.4000000	.9920645	.0158089	.00000	1.00000	.0004392	.0000000	.0000000
29	15.8197880	2.4000000							
	16.3242929	2.4000000	.9906911	.0185312	.00000	1.00000	.0001990	.0000000	.0000000
30	16.8287981	2.4000000							
	17.3333035	2.4000000	.9901955	.0196911	.00000	1.00000	.0000858	.0000000	.0000000
31	17.8378091	2.4000000							
	18.3423140	2.4000000	.9898734	.0201566	.00000	1.00000	.0000366	.0000000	.0000000
32	18.8468189	2.4000000							
	19.3513243	2.4000000	.9897757	.0203441	.00000	1.00000	.0000155	.0000000	.0000000
33	19.8558300	2.4000000							
	20.3603354	2.4000000	.9897375	.0204197	.00000	1.00000	.0000065	.0000000	.0000000
34	20.8648410	2.4000000							
	21.3693459	2.4000000	.9897221	.0204502	.00000	1.00000	.0000027	.0000000	.0000000
35	21.8738511	2.4000000							
	22.3783565	2.4000000	.9897159	.0204624	.00000	1.00000	.0000011	.0000000	.0000000
36	22.8828621	2.4000000							
	23.3873670	2.4000000	.9897134	.0204674	.00000	1.00000	.0000005	.0000000	.0000000
37	23.8918719	2.4000000							
	24.3963773	2.4000000	.9897125	.0204692	.00000	1.00000	.0000002	.0000000	.0000000
38	24.9008830	2.4000000							
	25.4053879	2.4000000	.9897122	.0204698	.00000	1.00000	-.0000000	.0000000	.0000000
39	25.9098930	2.4000000							
	26.4143984	2.4000000	.9897125	.0204691	.00000	1.00000	-.0000002	.0000000	.0000000
40	26.9189041	2.4000000							
	27.4234090	2.4000000	.9897137	.0204669	.00000	1.00000	-.0000004	.0000000	.0000000
41	27.9279139	2.4000000							
	28.4324193	2.4000000	.9897167	.0204609	.00000	1.00000	-.0000010	.0000000	.0000000
42	28.9369249	2.4000000							
	29.4414299	2.4000000	.9897242	.0204459	.00000	1.00000	-.0000023	.0000000	.0000000
43	29.9459350	2.4000000							
	30.4504404	2.4000000	.9897432	.0204064	.00000	1.00000	-.0000052	.0000000	.0000000
44	30.9549460	2.4000000							
	31.4594514	2.4000000	.9897901	.0203156	.00000	1.00000	-.0000113	.0000000	.0000000

POTENTIAL FLOW – CODE RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
45	31.9639571	2.4000003							
	32.4684620	2.4000000	.9899047	.0200887	.00000	1.00000	-.0000238	.0000000	.0000000
46	32.9729671	2.4000005							
	33.4774718	2.4000003	.9931768	.0195500	.00000	1.00003	-.0000473	.0000000	.0000000
47	33.9819770	2.4000000							
	34.4864821	2.4000003	.9907846	.0183458	.00000	1.00000	-.0000862	-.0000000	.0000000
48	34.9909878	2.4000000							
	35.4954939	2.4000000	.9920616	.0158138	.00000	1.00000	-.0001401	-.0000000	.0000000
49	36.0000000	2.4000003							
50	36.0000000	6.0000003							
	35.4954939	6.0000000	-.9865953	.0266297	.00000	-1.00003	.0055332	-.0000000	.0000000
51	34.9909878	6.0000000							
	34.4864821	6.0000003	-.9886103	.0226496	.00000	-1.00003	.0087381	-.0000000	.0000000
52	33.9819770	6.0000000							
	33.4774718	6.0000003	-.9893293	.0212275	.00000	-1.00000	.0114770	-.0000000	.0000000
53	32.9729671	6.0000000							
	32.4684620	6.0000000	-.98956[illegible]9	.0207604	.00000	-1.00000	.0140465	-.0000000	.0000000
54	31.9639571	6.0000003							
	31.4594514	6.0000000	-.9896528	.0205873	.00000	-1.00000	.0165468	-.0000000	.0000000
55	30.9549460	6.0000003							
	30.4504404	6.0000000	-.9896872	.0205193	.00000	-1.00003	.0190187	-.0000000	.0000000
56	29.9459350	6.0000000							
	29.4414299	6.0000003	-.9897010	.0204920	.00000	-1.00003	.0214826	-.0000000	.0000000
57	28.9369249	6.0000000							
	28.4324193	6.0000003	-.9897066	.0204808	.00000	-1.00000	.0239507	-.0000000	.0000000
58	27.9279139	6.0000000							
	27.4234090	6.0000000	-.9897090	.0204762	.00000	-1.00000	.0264316	-.0000000	.0000000
59	26.9189041	6.0000003							
	26.4143984	6.0000000	-.9897098	.0204744	.00000	-1.00000	.0289318	-.0000000	.0000000
60	25.9098930	6.0000003							
	25.4053879	6.0000000	-.9897101	.0204739	.00000	-1.00003	.0314572	-.0000000	.0000000
61	24.9008830	6.0000000							
	24.3963773	6.0000003	-.9897099	.0204743	.00000	-1.00003	.0340132	-.0000000	.0000000
62	23.8918719	6.0000000							
	23.3873670	6.0000003	-.9897092	.0204756	.00000	-1.00000	.0366055	-.0000000	.0000000
63	22.8828621	6.0000000							
	22.3783565	6.0000000	-.9897074	.0204793	.00000	-1.00000	.0392402	-.0000000	.0000000
64	21.8738511	6.0000003							
	21.3693459	6.0000000	-.9897029	.0204881	.00000	-1.00000	.0419238	-.0000000	.0000000
65	20.8648410	6.0000003							
	20.3603354	6.0000000	-.9896920	.0205097	.00000	-1.00003	.0446642	-.0000000	.0000000
66	19.8558300	6.0000000							

19.3513243	6.0000000	-.9896653	.0205627	.00000	-1.00000	.0474714	-.0000000	.0000000

POTENTIAL FLOW - FOOF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQCI PSF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
67	18.8468189	6.0000000							
	18.3423140	6.0000000	-.9895995	.0236929	.00000	-1.00000	.0503591	-.0000000	.0000000
68	17.8378091	6.0000000							
	17.3333035	6.0000000	-.9894367	.0213153	.00000	-1.00000	.0533491	-.0000000	.0000000
69	16.8287981	6.0000000							
	16.3242929	6.0000000	-.9890367	.0218064	.00000	-1.00000	.0564815	-.0000000	.0000000
70	15.8197880	6.0000000							
	15.3627670	6.0000000	-.9881334	.0235924	.00000	-1.00000	.0596725	-.0000000	.0000000
71	14.9057460	6.0000000							
	14.5248954	6.0000000	-.9854132	.0269897	.00000	-1.00000	.0627325	-.0000000	.0000000
72	14.1440450	6.0000000							
	13.8266695	6.0000000	-.9836181	.0324954	.00000	-1.00000	.0656290	-.0000000	.0000000
73	13.5092940	6.0000000							
	13.2448145	6.0000000	-.9795522	.0404775	.00000	-1.00000	.0684464	.0000000	.0000000
74	12.9803350	6.0000000							
	12.7599355	6.0000000	-.9741324	.0510661	.00000	-1.00000	.0712358	.0000000	.0000000
75	12.5395360	6.0000000							
	12.3558694	6.0000000	-.9673312	.0642703	.00000	-1.00000	.0740139	.0000000	.0000000
76	12.1722029	6.0000000							
	12.0191474	6.0000000	-.9589990	.0803213	.00000	-1.00000	.0767737	.0000000	.0000000
77	11.8660920	6.0000000							
	11.7385459	6.0000000	-.9472911	.1026395	.00000	-1.00000	.0795481	.0000000	.0000000
78	11.6109999	6.0000000							
	11.4849260	5.9993738	-.9332503	.1290445	-.00763	-.99997	.0837985	.0000000	.0000000
79	11.3588570	5.9980749							
	11.2336416	5.9957247	-.9237664	.1466557	-.02232	-.99975	.0885712	.0000001	.0000000
80	11.1084460	5.9924832							
	10.9840175	5.9884013	-.9202657	.1531110	-.03613	-.99935	.0924526	.0000001	.0000000
81	10.8596190	5.9834879							
	10.7359110	5.9777992	-.9197687	.1558642	-.04926	-.99880	.0956374	.0000001	.0000000
82	10.6122410	5.9713367							
	10.4891906	5.9641594	-.9188913	.1556388	-.06114	-.99813	.0980280	.0000001	.0000000
83	10.3661840	5.9562637							
	10.2437339	5.9477100	-.9202495	.1531408	-.07239	-.99738	.0997406	.0000001	.0000000
84	10.1213320	5.9384915							
	9.9994266	5.9286683	-.9226040	.1488018	-.08283	-.99656	.1007968	.0000001	.0000000
85	9.8775721	5.9182321							
	9.7561605	5.9072418	-.9257944	.1429049	-.09246	-.99572	.1012643	.0000001	.0000000
86	9.6348013	5.8956888							
	9.5138347	5.8836297	-.9297154	.1356293	-.10131	-.99485	.1012174	.0000001	.0000000
87	9.3929205	5.8710566							
	9.2723523	5.8580235	-.9343003	.1270830	-.10940	-.99400	.1007306	.0000001	.0000000
88	9.1518356	5.8445236							
	9.0316215	5.8306083	-.9395135	.1173200	-.11673	-.99316	.0998732	.0000001	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. RF0C1 PSF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
89	8.9114568	5.8162720							
	8.7915541	5.8015628	-.9453287	.1063536	-.12332	-.99237	.0987081	.0000002	.0000000
90	8.6716980	5.7864783							
	8.5520655	5.7710621	-.9517562	.0941601	-.12918	-.99162	.0972887	.0000001	.0000000
91	8.4324759	5.7553149							
	8.3130736	5.7392761	-.9588013	.0807301	-.13432	-.99094	.0956602	.0000001	.0000000
92	8.1937132	5.7229496							
	8.0744991	5.7063711	-.9664843	.0659782	-.13876	-.99033	.0938586	.0000002	.0000000
93	7.9553225	5.6895475							
	7.8362648	5.6725104	-.9748268	.0497128	-.14250	-.98979	.0919123	.0000001	.0000000
94	7.7172364	5.6552704							
	7.5982949	5.6378548	-.9838502	.0320388	-.14555	-.98935	.0898427	.0000001	.0000000
95	7.4793769	5.6202781							
	7.3605146	5.6025631	-.9935728	.0128131	-.14791	-.98900	.0876650	.0000001	.0000000
96	7.2416701	5.5847288							
	7.1228507	5.5667928	-1.0040089	-.0080339	-.14956	-.98875	.0853398	.0000001	.0000000
97	7.0040429	5.5487792							
	6.8852304	5.5306991	-1.0151496	-.0305268	-.15058	-.98863	.0830220	.0000001	.0000000
98	6.7664229	5.5125053							
	6.6475802	5.4944441	-1.0270045	-.0547383	-.15090	-.98855	.0805707	.0000001	.0000000
99	6.5287375	5.4763030							
	6.4099334	5.4581981	-1.0395717	-.0807093	-.15054	-.98860	.0780313	.0000051	.0000000
100	6.2910579	5.4401098							
	6.1722546	5.4221053	-1.0527922	-.1083715	-.14950	-.98876	.0754026	.0000001	.0000000
101	6.0534394	5.4041839							
	5.9346336	5.3863657	-1.0666164	-.1376705	-.14779	-.98902	.0726870	.0000001	.0000000
102	5.8158397	5.3686723							
	5.6969648	5.3511245	-1.0810003	-.1685616	-.14539	-.98937	.0698812	.0000001	.0000000
103	5.5780960	5.3337401							
	5.4591755	5.3165385	-1.0958819	-.2009571	-.14231	-.98982	.0669822	.0000001	.0000000
104	5.3402255	5.2995417							
	5.2211922	5.2827654	-1.1111877	-.2347381	-.13853	-.99036	.0639873	.0000001	.0000000
105	5.1021244	5.2662359							
	4.9829406	5.2499650	-1.1268376	-.2697629	-.13406	-.99097	.0608953	.0000001	.0000000
106	4.8637178	5.2339833							
	4.7443452	5.2182993	-1.1427445	-.3058649	-.12889	-.99166	.0577055	.0000001	.0000000
107	4.6249295	5.2029475							
	4.5053288	5.1879330	-1.1588161	-.3428546	-.12300	-.99241	.0544703	.0000001	.0000000
108	4.3856817	5.1732945							
	4.2658126	5.1590343	-1.1749613	-.3805349	-.11639	-.99320	.0510435	.0000001	.0000000
109	4.1458942	5.1451945							
	4.0257148	5.1317750	-1.1910885	-.4186917	-.10905	-.99404	.0475833	.0000001	.0000000
110	3.9054843	5.1188215							
	3.7849513	5.1063317	-1.2071184	-.4571349	-.10095	-.99489	.0440515	.0000001	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
111	3.6643663	5.0943546							
	3.5434346	5.0828863	-1.2229894	-.4957030	-.09210	-.99575	.0404649	.0000001	.0000000
112	3.4224512	5.0719786							
	3.3010736	5.0616265	-1.2386766	-.5343198	-.08248	-.99659	.0368453	.0000001	.0000000
113	3.1796457	5.0518849							
	3.0577727	5.0427473	-1.2542202	-.5730684	-.07206	-.99740	.0332187	.0000001	.0000000
114	2.9358520	5.0342705							
	2.8134310	5.0264507	-1.2697780	-.6123361	-.06084	-.99815	.0296152	.0000001	.0000000
115	2.6909667	5.0193437							
	2.5679423	5.0129486	-1.2857385	-.6531235	-.04880	-.99881	.0260688	.0000001	.0000000
116	2.4448805	5.0073232							
	2.3211935	5.0024620	-1.3029822	-.6977626	-.03592	-.99935	.0226242	.0000000	.0000000
117	2.1974770	4.9984267							
	2.0730640	4.9952242	-1.3236408	-.7520249	-.02219	-.99975	.0193530	.0000000	.0000000
118	1.9486315	4.9929024							
	1.8233214	4.9912016	-1.3605262	-.8510316	-.00759	-.99997	.0163330	.0000000	.0000000
119	1.6980000	4.9910000							
	1.6122447	4.9923773	-1.4072507	-.9803546	.02530	-.99968	.0099352	.0000000	.0000000
120	1.5265295	4.9953400							
	1.4451099	5.0004653	-1.4317451	-1.0498940	.07516	-.99717	.0002536	.0000000	.0000000
121	1.3638420	5.0076025							
	1.2867347	5.0162761	-1.4338209	-1.0558423	.12396	-.99229	-.0087796	.0000000	.0000000
122	1.2098634	5.0268385							
	1.1370124	5.0386708	-1.4251488	-1.0310490	.17254	-.98500	-.0174140	.0000000	.0000000
123	1.0644770	5.0523051							
	.9958170	5.0669729	-1.4376150	-.9813830	.22163	-.97513	-.0257855	-.0000000	.0000000
124	.9275536	5.0834259							
	.8630218	5.1037383	-1.3818800	-.9095924	.27196	-.96231	-.0340060	-.0000000	.0000000
125	.7989744	5.1197639							
	.7385202	5.1395319	-1.3477921	-.8165435	.32423	-.94598	-.0421747	-.0000002	.0000000
126	.6786504	5.1610051							
	.6222442	5.1831179	-1.3045140	-.7017567	.37921	-.92531	-.0503855	-.0000001	.0000000
127	.5665420	5.2069486							
	.5141859	5.2313510	-1.2504653	-.5636635	.43766	-.89914	-.0587268	-.0000002	.0000000
128	.4626816	5.2575035							
	.4154019	5.2836321	-1.1839759	-.4017989	.49976	-.86617	-.0671861	-.0000002	.0000000
129	.3691185	5.3114873							
	.3262277	5.3396325	-1.1022068	-.2148598	.56589	-.82448	-.0757972	-.0000002	.0000000
130	.2845438	5.3695360							
	.2462618	5.3996398	-1.0005593	-.0011188	.63658	-.77121	-.0845720	-.0000002	.0000000
131	.2094480	5.4315221							
	.1761083	5.4634883	-.8735800	.2368579	.71141	-.70277	-.0934085	-.0000002	.0000000
132	.1445518	5.4972162							
	.1176815	5.5294433	-.7188136	.4833070	.78679	-.61728	-.1017958	-.0000801	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.3 2-BODY CASE NO. BFQC1 PSF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
133	.0927733	5.5632098							
	.0710643	5.5969337	-.5323939	.7165567	.85888	-.51218	-.1092399	-.0000001	.0000000
134	.0517239	5.6320462							
	.0356628	5.6669440	-.3370881	.9056969	.92349	-.38363	-.1151189	-.0000001	.0000000
135	.0222693	5.7029500							
	.0122057	5.7384667	-.0407090	.9983428	.97232	-.23365	-.1183271	-.0000001	.0000000
136	.0050333	5.7746781							
	.0010348	5.8072249	.2501597	.9374202	.99704	-.07683	-.1160871	-.0000001	.0000000
137	.0000000	5.8430003							
	.0027027	5.8743638	.6029925	.6364001	.98884	.14931	-.1038719	-.0000001	.0000000
138	.0102465	5.9079982							
	.0232597	5.9373530	.9503906	.0967577	.88255	.47322	-.0770077	-.0000002	.0000000
139	.0403651	5.9645276							
	.0596903	5.9879149	1.1138361	-.2406308	.73832	.67445	-.0558369	-.0000001	.0000000
140	.0812386	6.0092714							
	.1021562	6.0271011	1.1760308	-.3830484	.62532	.78037	-.0425994	-.0000001	.0000000
141	.1241164	6.0436297							
	.1491852	6.0605449	1.2014840	-.4435538	.54000	.84167	-.0339068	-.0000001	.0000000
142	.1750100	6.0762821							
	.2038299	6.0922922	1.2120775	-.4691319	.46974	.88281	-.0275121	-.0000000	.0000000
143	.2332099	6.1072499							
	.2655795	6.1224563	1.2146721	-.4754282	.41208	.91115	-.0228420	-.0000000	.0000000
144	.2983746	6.1367220							
	.3342397	6.1512396	1.2131586	-.4717537	.36425	.93130	-.0194191	-.0000000	.0000000
145	.3704374	6.1649070							
	.4098453	6.1788353	1.2095390	-.4629845	.32392	.94609	-.0169045	-.0000000	.0000000
146	.4495205	6.1919833							
	.4925903	6.2053987	1.2048752	-.4517243	.28933	.95723	-.0150646	-.0000000	.0000000
147	.5358801	6.2180863							
	.5827839	6.2310433	1.1997396	-.4393752	.25919	.96583	-.0137349	-.0000000	.0000000
148	.6298728	6.2433105							
	.6808255	6.2558419	1.1944400	-.4266868	.23251	.97259	-.0127999	.0000000	.0000000
149	.7319366	6.2677103							
	.7871896	6.2798304	1.1891464	-.4140693	.20855	.97801	-.0121747	-.0000000	.0000000
150	.8425804	6.2913041							
	.9024184	6.3030087	1.1839467	-.4017298	.18673	.98241	-.0117942	-.0000000	.0000000
151	.9623779	6.3140746							
	1.0271180	6.3253413	1.1788786	-.3897548	.16659	.98603	-.0116067	-.0000000	.0000000
152	1.0919561	6.3359682							
	1.1619567	6.3467551	1.1739498	-.3781582	.14773	.98903	-.0115676	.0000000	.0000000
153	1.2320445	6.3568918							
	1.3076668	6.3671342	1.1691399	-.3668882	.12982	.99154	-.0116357	-.0000000	.0000000
154	1.3833770	6.3767059							
	1.4650454	6.3863122	1.1644032	-.3558349	.11254	.99365	-.0117698	-.0000000	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	II	CP	SIN A	COS A	SIGMA	N	PHI
155	1.5467935	6.3952146							
	1.6349574	6.4040560	1.1596567	-.3448021	.09555	.99542	-.0119235	-.0000009	.0000000
156	1.7231938	6.4121470							
	1.8183392	6.4200526	1.1547462	-.3334388	.07846	.99692	-.0120423	-.0000008	.0000000
157	1.9135580	6.4271276							
	2.0162014	6.4338492	1.1493931	-.3211044	.06071	.99816	-.0120487	-.0000008	.0000000
158	2.1189137	6.4396189							
	2.2296323	6.4447969	1.1430560	-.3065770	.04138	.99914	-.0118022	-.0000008	.0000000
159	2.3404030	6.4487910							
	2.4606987	6.4515117	1.1296806	-.2761784	.01749	.99985	-.0109024	-.0000008	.0000000
160	2.5810000	6.4530000							
	2.7100000	6.4530000	1.1048596	-.2207146	.00000	1.00000	-.0114493	-.0000001	.0000000
161	2.8390000	6.4530000							
	2.9680000	6.4530000	1.0829748	-.1729345	.00000	1.00000	-.0149346	-.0000001	.0000000
162	3.0970000	6.4530000							
	3.2260000	6.4530000	1.0714438	-.1479917	.00000	1.00000	-.0181945	-.0000001	.0000000
163	3.3550000	6.4530000							
	3.4839999	6.4530000	1.0629126	-.1297832	.00000	1.00000	-.0213197	-.0000001	.0000000
164	3.6129999	6.4530000							
	3.7419999	6.4530000	1.0562431	-.1156495	.00000	1.00000	-.0243565	-.0000001	.0000000
165	3.8709999	6.4530000							
	3.9999999	6.4530000	1.0508351	-.1042544	.00000	1.00000	-.0273346	-.0000001	.0000000
166	4.1289999	6.4530000							
	4.2579998	6.4530000	1.0463384	-.0948240	.00000	1.00000	-.0302734	-.0000001	.0000000
167	4.3869998	6.4530000							
	4.5159998	6.4530000	1.0425292	-.0866671	.00000	1.00000	-.0331960	-.0000001	.0000000
168	4.6449998	6.4530000							
	4.7739998	6.4530000	1.0392553	-.0800515	.00000	1.00000	-.0360912	-.0000001	.0000000
169	4.9029998	6.4530000							
	5.0319998	6.4530000	1.0364062	-.0741420	.00000	1.00000	-.0389649	-.0000001	.0000000
170	5.1609997	6.4530000							
	5.2899997	6.4530000	1.0339083	-.0689664	.00000	1.00000	-.0418410	-.0000002	.0000000
171	5.4189997	6.4530000							
	5.5479996	6.4530000	1.0316951	-.0643948	.00000	1.00000	-.0447120	-.0000002	.0000000
172	5.6769996	6.4530000							
	5.8059996	6.4530000	1.0297217	-.0603268	.00000	1.00000	-.0475791	-.0000003	.0000000
173	5.9349996	6.4530000							
	6.0639995	6.4530000	1.0279514	-.0566840	.00000	1.00000	-.0504427	-.0000003	.0000000
174	6.1929995	6.4530000							
	6.3219995	6.4530000	1.0263546	-.0534037	.00000	1.00000	-.0533019	-.0000003	.0000000
175	6.4509995	6.4530000							
	6.5799995	6.4530000	1.0249073	-.0504350	.00000	1.00000	-.0561547	-.0000003	.0000000
176	6.7089995	6.4530000							
	6.8379995	6.4530000	1.0235901	-.0477367	.00000	1.00000	-.0589975	-.0000003	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
177	6.9669994	6.4530000							
	7.0959994	6.4530000	1.0223863	-.0452738	.00000	1.00000	-.0618242	-.0000003	.0000000
178	7.2249994	6.4530000							
	7.3539994	6.4530000	1.0212823	-.0430176	.00000	1.00000	-.0646264	-.0000003	.0000000
179	7.4829993	6.4530000							
	7.6119993	6.4530000	1.0202672	-.0409447	.00000	1.00000	-.0673915	-.0000004	.0000000
180	7.7409993	6.4530000							
	7.8699992	6.4530000	1.0193301	-.0390339	.00000	1.00000	-.0701023	-.0000003	.0000000
181	7.9989992	6.4530000							
	8.1279991	6.4530000	1.0184639	-.0372686	.00000	1.00000	-.0727359	-.0000003	.0000000
182	8.2569991	6.4530000							
	8.3859991	6.4530000	1.0176601	-.0356321	.00000	1.00000	-.0752621	-.0000003	.0000000
183	8.5149990	6.4530000							
	8.6439990	6.4530000	1.0169132	-.0341129	.00000	1.00000	-.0776425	-.0000004	.0000000
184	8.7729989	6.4530000							
	8.9019989	6.4530000	1.0162173	-.0326977	.00000	1.00000	-.0798296	-.0000004	.0000000
185	9.0309988	6.4530000							
	9.1599988	6.4530000	1.0155673	-.0313769	.00000	1.00000	-.0817658	-.0000006	.0000000
186	9.2889987	6.4530000							
	9.4179987	6.4530000	1.0149565	-.0301408	.00000	1.00000	-.0833846	-.0000004	.0000000
187	9.5469986	6.4530000							
	9.6759986	6.4530000	1.0143971	-.0289811	.00000	1.00000	-.0846112	-.0000004	.0000000
188	9.8049985	6.4530000							
	9.9339982	6.4530000	1.0138490	-.0278898	.00000	1.00000	-.0853670	-.0000004	.0000000
189	10.0629981	6.4530000							
	10.1919980	6.4530000	1.0133399	-.0268577	.00000	1.00000	-.0855748	-.0000004	.0000000
190	10.3209980	6.4530000							
	10.4499979	6.4530000	1.0128576	-.0258804	.00000	1.00000	-.0851681	-.0000005	.0000000
191	10.5789980	6.4530000							
	10.7079979	6.4530000	1.0123975	-.0249486	.00000	1.00000	-.0841034	-.0000005	.0000000
192	10.8369980	6.4530000							
	10.9659979	6.4530000	1.0119528	-.0240485	.00000	1.00000	-.0823770	-.0000005	.0000000
193	11.0949980	6.4530000							
	11.2239980	6.4530000	1.0115052	-.0231428	.00000	1.00000	-.0800536	-.0000005	.0000000
194	11.3529980	6.4530000							
	11.4819989	6.4530000	1.0113899	-.022[illegible]	.00000	1.00000	-.0773275	-.0000004	.0000000
195	11.6109999	6.4530000							
	11.7399999	6.4530000	1.0107809	-.0210[illegible]	.00000	1.00000	-.0745566	-.0000005	.0000000
196	11.8690000	6.4530000							
	12.0237999	6.4530000	1.0104849	-.021[illegible]	.00000	1.00000	-.0718294	-.0000004	.0000000
197	12.1786000	6.4530000							
	12.3643600	6.4530000	1.0100852	-.02[illegible]	.00000	1.00000	-.0690887	-.0000004	.0000000
198	12.5501200	6.4530000							
	12.7730319	6.4530000	1.0096146	-.0193215	.00000	1.00000	-.0663748	-.0000005	.0000000

POTENTIAL FLOW - FODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.3 2-BODY CASE NO. BFQC1 PSF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
199	12.9959440	6.4530000							
	13.2634380	6.4530000	1.0090960	-.0182746	.00000	1.00000	-.0636837	-.0000004	.0000000
200	13.5309319	6.4530000							
	13.8519255	6.4530000	1.0085308	-.0171343	.00000	1.00000	-.0609909	-.0000004	.0000000
201	14.1729190	6.4530000							
	14.5581110	6.4530000	1.0079207	-.0159042	.00000	1.00000	-.0582431	-.0000005	.0000000
202	14.9433030	6.4530000							
	15.4055330	6.4530000	1.0072711	-.0145950	.00000	1.00000	-.0553561	-.0000004	.0000000
203	15.8677630	6.4530000							
	16.3710690	6.4530000	1.0066237	-.0132912	.00000	1.00000	-.0523765	-.0000003	.0000000
204	16.8743751	6.4530000							
	17.3776810	6.4530000	1.0060465	-.0121295	.00000	1.00000	-.0494739	-.0000003	.0000000
205	17.8809869	6.4530000							
	18.3842928	6.4530000	1.0055537	-.0111382	.00000	1.00000	-.0467040	-.0000003	.0000000
206	18.8875990	6.4530000							
	19.3909049	6.4530000	1.0051265	-.0102832	.00000	1.00000	-.0440289	-.0000003	.0000000
207	19.8942111	6.4530000							
	20.3975165	6.4530000	1.0047592	-.0095410	.00000	1.00000	-.0414280	-.0000003	.0000000
208	20.9008219	6.4530000							
	21.4041278	6.4530000	1.0044375	-.0088946	.00000	1.00000	-.0388887	-.0000003	.0000000
209	21.9074340	6.4530000							
	22.4107399	6.4530000	1.0041568	-.0083309	.00000	1.00000	-.0364016	-.0000002	.0000000
210	22.9140460	6.4530000							
	23.4173520	6.4530000	1.0039126	-.0078405	.00000	1.00000	-.0339597	-.0000002	.0000000
211	23.9206581	6.4530000							
	24.4239640	6.4530000	1.0037013	-.0074163	.00000	1.00000	-.0315566	-.0000002	.0000000
212	24.9272699	6.4530000							
	25.4305758	6.4530000	1.0035207	-.0070537	.00000	1.00000	-.0291870	-.0000002	.0000000
213	25.9338820	6.4530000							
	26.4371874	6.4530000	1.0033696	-.0067506	.00000	1.00000	-.0268456	-.0000002	.0000000
214	26.9404931	6.4530000							
	27.4437990	6.4530000	1.0032484	-.0065074	.00000	1.00000	-.0245274	-.0000002	.0000000
215	27.9471049	6.4530000							
	28.4504108	6.4530000	1.0031592	-.0063284	.00000	1.00000	-.0222271	-.0000002	.0000000
216	28.9537170	6.4530000							
	29.4570229	6.4530000	1.0031068	-.0062233	.00000	1.00000	-.0199384	-.0000002	.0000000
217	29.9603291	6.4530000							
	30.4636350	6.4530000	1.0031011	-.0062118	.00000	1.00000	-.0176536	-.0000001	.0000000
218	30.9669411	6.4530000							
	31.4702466	6.4530000	1.0031608	-.0063315	.00000	1.00000	-.0153615	-.0000001	.0000000
219	31.9735520	6.4530000							
	32.4768577	6.4530000	1.0033257	-.0066624	.00000	1.00000	-.0130429	-.0000001	.0000000
220	32.9801641	6.4530000							
	33.4834700	6.4530000	1.0036948	-.0074032	.00000	1.00000	-.0106599	-.0000001	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
221	33.9867759	6.4530000							
	34.4900818	6.4530000	1.0045893	-.0091996	.00000	1.00000	-.0061195	-.0000000	.0000000
222	34.9933882	6.4530000							
	35.4966941	6.4530000	1.0068482	-.0137433	.00000	1.00000	-.0051480	-.0000000	.0000000
223	36.0000000	6.4530000							

ADDED MASS = .0000000 VOLUME = 1335.0865936 SUM (T)(DELTA S) = 28.6915860

POTENTIAL FLOW – CODE RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOCI PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
1	8.0110000	.0000003							
	8.0152085	.1151024	1.3431453	-.8040259	.99742	.07174	2.9175955	-.0000012	.0000000
2	8.0275149	.2296225							
	8.0482578	.3442699	-.2379532	.9433783	.97723	.21217	1.8797040	-.0000033	.0000000
3	8.0769252	.4571968							
	8.1128740	.5668563	.0173212	.9997003	.93964	.34216	1.4328921	-.0000004	.0000000
4	8.1558563	.6739545							
	8.2057551	.7786683	.0420797	.9982293	.88942	.45739	1.1590825	-.0000007	.0000000
5	8.2618482	.8801982							
	8.3240924	.9789353	.0541076	.9970724	.83099	.55629	.9668429	-.0000011	.0000000
6	8.3916585	1.0741093							
	8.4645996	1.1662225	.0622022	.9961309	.76826	.64013	.8218058	-.0000017	.0000000
7	8.5420380	1.2545893							
	8.6241082	1.3397385	.0683682	.9953258	.70414	.71006	.7069110	-.0000001	.0000000
8	8.7099422	1.4210927							
	8.7967980	1.4967089	.0728940	.9946865	.64148	.76714	.6138926	-.0000004	.0000000
9	8.8865939	1.5688088							
	8.9802898	1.6383442	.0763558	.9941698	.58112	.81382	.5359773	.0000001	.0000000
10	9.0764732	1.7043962							
	9.1759719	1.7676933	.0790533	.9937506	.52235	.85273	.4677701	-.0000002	.0000000
11	9.2775625	1.8275751							
	9.3819519	1.8846010	.0811404	.9934162	.46548	.88506	.4070175	-.0000005	.0000000
12	9.4880913	1.9382993							
	9.5965809	1.9890973	.0827026	.9931603	.41060	.91182	.3520244	.0000000	.0000000
13	9.7065265	2.0366519							
	9.8184350	2.0813177	.0838335	.9929719	.35762	.93387	.3015096	-.0000001	.0000000
14	9.9315463	2.1228321							
	10.0462868	2.1614498	.0846025	.9928424	.30639	.95191	.2544692	-.0000007	.0000000
15	10.1620110	2.1970111							
	10.2790741	2.2296982	.0850782	.9927617	.25669	.96649	.2101040	-.0000003	.0000000
16	10.3969290	2.2594733							
	10.5158712	2.2862602	.0853094	.9927223	.20830	.97807	.1677446	-.0000003	.0000000
17	10.6354350	2.3101971							
	10.7558620	2.3313297	.0853679	.9927123	.16095	.98696	.1268158	.0000004	.0000000
18	10.8767570	2.3495523							
	10.9983147	2.3649888	.0854064	.9927057	.11442	.99343	.0867941	.0000001	.0000000
19	11.1201990	2.3775911							
	11.2425621	2.3873996	.0867395	.9924763	.06845	.99765	.0471027	-.0000000	.0000000
20	11.3651180	2.3943955							
	11.4880365	2.3981811	.0806018	.9935033	.02279	.99974	.0071924	.0000007	.0000000
21	11.6109999	2.4000000							
	11.7385459	2.4000000	.0517819	.9973186	.00000	1.00000	-.0115786	-.0000001	.0000000
22	11.8660920	2.4000000							
	12.0191474	2.4000000	.0748328	.9944001	.00000	1.00000	-.0085925	-.0000000	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
23	12.1722029	2.4000000							
	12.3558694	2.4000000	.0733364	.9946218	.00000	1.00000	-.0060584	-.0000000	.0000000
24	12.5395360	2.4000000							
	12.7599355	2.4000000	.0726824	.9947289	.00000	1.00000	-.0039986	-.0000000	.0000000
25	12.9803350	2.4000000							
	13.2448145	2.4000000	.0720483	.9948091	.00000	1.00000	-.0024356	-.0000000	.0000000
26	13.5092940	2.4000000							
	13.8266695	2.4000000	.0716404	.9948677	.00000	1.00000	-.0013456	.0000000	.0000000
27	14.1440450	2.4000000							
	14.5248954	2.4000000	.0713587	.9949379	.00000	1.00000	-.0006606	-.0000000	.0000000
28	14.9057460	2.4000000							
	15.3627670	2.4000000	.0711754	.9949341	.00000	1.00000	-.0002810	-.0000000	.0000000
29	15.8197880	2.4000000							
	16.3242929	2.4000000	.0710646	.9949498	.00000	1.00000	-.0001053	.0000000	.0000000
30	16.8287981	2.4000000							
	17.3333035	2.4000000	.0710125	.9949572	.00000	1.00000	-.0000375	-.0000000	.0000000
31	17.8378091	2.4000000							
	18.3423140	2.4000000	.0709912	.9949603	.00000	1.00000	-.0000132	.0000000	.0000000
32	18.8468189	2.4000000							
	19.3513243	2.4000000	.0709835	.9949614	.00000	1.00000	-.0000049	.0000000	.0000000
33	19.8558300	2.4000000							
	20.3603354	2.4000000	.0709812	.9949617	.00000	1.00000	-.0000019	.0000000	.0000000
34	20.8648410	2.4000000							
	21.3693459	2.4000000	.0709802	.9949618	.00000	1.00000	-.0000014	.0000000	.0000000
35	21.8738511	2.4000000							
	22.3783565	2.4000000	.0709833	.9949614	.00000	1.00000	-.0000022	.0000000	.0000000
36	22.8828621	2.4000000							
	23.3873670	2.4000000	.0709896	.9949605	.00000	1.00000	-.0000050	.0000000	.0000000
37	23.8918719	2.4000000							
	24.3963773	2.4000000	.0710084	.9949578	.00000	1.00000	-.0000127	.0000000	.0000000
38	24.9008830	2.4000000							
	25.4053879	2.4000000	.0710572	.9949509	.00000	1.00000	-.0000313	.0000000	.0000000
39	25.9098930	2.4000000							
	26.4143984	2.4000000	.0711789	.9949336	.00000	1.00000	-.0000779	.0000000	.0000000
40	26.9189041	2.4000000							
	27.4234090	2.4000000	.0714939	.9948901	.00000	1.00000	-.0001942	.0000000	.0000000
41	27.9279139	2.4000000							
	28.4324193	2.4000000	.0722369	.9947818	.00000	1.00000	-.0004847	-.0000000	.0000000
42	28.9369249	2.4000000							
	29.4414299	2.4000000	.0740924	.9945103	.00000	1.00000	-.0012093	-.0000001	.0000000
43	29.9459350	2.4000000							
	30.4504404	2.4000000	.0786858	.9938086	.00000	1.00000	-.0030227	-.0000001	.0000000
44	30.9549460	2.4000000							
	31.4594514	2.4000000	.0901115	.9918799	.00000	1.00000	-.0075709	-.0000001	.0000000

POTENTIAL FLOW - CODE RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
45	31.9639571	2.4000000							
	32.4684620	2.4000000	.1187749	.9858925	.00000	1.00000	-.0190362	-.0000002	.0000000
46	32.9729671	2.4000000							
	33.4774718	2.4000000	.1922080	.9630561	.00000	1.00000	-.0483782	-.0000001	.0000000
47	33.9819770	2.4000000							
	34.4864821	2.4000000	.3381897	.8856277	.00000	1.00000	-.1272476	-.0000003	.0000000
48	34.9909878	2.4000000							
	35.4954939	2.4000000	1.8657461	-2.4810086	.00000	1.00000	-.4055443	-.0000007	.0000000
49	36.0000000	2.4000000							
50	36.0000000	6.0000000							
	35.4954939	6.0000000	.3466245	.8798515	.00000	-1.00000	.2449708	.0000000	.0000000
51	34.9909878	6.0000000							
	34.4864821	6.0000000	.1138731	.9858644	.00000	-1.00000	.3224441	.0000002	.0000000
52	33.9819770	6.0000000							
	33.4774718	6.0000000	.0088481	.9999217	.00000	-1.00000	.3554771	.0000002	.0000000
53	32.9729671	6.0000000							
	32.4684620	6.0000000	-.0378332	.9985687	.00000	-1.00000	.3686712	.0000002	.0000000
54	31.9639571	6.0000000							
	31.4594514	6.0000000	-.0573428	.9967118	.00000	-1.00000	.3724831	.0000000	.0000000
55	30.9549460	6.0000000							
	30.4504404	6.0000000	-.0653902	.9957241	.00000	-1.00000	.3714600	.0000000	.0000000
56	29.9459350	6.0000000							
	29.4414299	6.0000000	-.0686852	.9952824	.00000	-1.00000	.3676856	-.0000001	.0000000
57	28.9369249	6.0000000							
	28.4324193	6.0000000	-.0700312	.9950956	.00000	-1.00000	.3621781	.0000002	.0000000
58	27.9279139	6.0000000							
	27.4234090	6.0000000	-.0705807	.9950184	.00000	-1.00000	.3554710	.0000000	.0000000
59	26.9189041	6.0000000							
	26.4143984	6.0000000	-.0708054	.9949866	.00000	-1.00000	.3478755	-.0000000	.0000000
60	25.9098930	6.0000000							
	25.4053879	6.0000000	-.0708994	.9949733	.00000	-1.00000	.3395867	-.0000001	.0000000
61	24.9008830	6.0000000							
	24.3963773	6.0000000	-.0709394	.9949676	.00000	-1.00000	.3307377	-.0000000	.0000000
62	23.8918719	6.0000000							
	23.3873670	6.0000000	-.0709578	.9949650	.00000	-1.00000	.3214250	-.0000002	.0000000
63	22.8828621	6.0000000							
	22.3783565	6.0000000	-.0709658	.9949639	.00000	-1.00000	.3117216	-.0000001	.0000000
64	21.8738511	6.0000000							
	21.3693459	6.0000000	-.0709702	.9949632	.00000	-1.00000	.3016841	.0000000	.0000000
65	20.8648410	6.0000000							
	20.3603354	6.0000000	-.0709724	.9949629	.00000	-1.00000	.2913577	-.0000001	.0000000
66	19.8558300	6.0000000							

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

19.3513243	6.0000000	-.3739725	.9949629	.00000	-1.00000	.2807788	-.0000001	.0000000

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
67	18.8468189	6.0000000							
	18.3423140	6.0000000	-.0709706	.9949632	.00000	-1.00000	.2699774	-.0000001	.0000000
68	17.8378091	6.0000000							
	17.3333035	6.0000000	-.0709620	.9949544	.00000	-1.00000	.2589781	-.0000000	.0000000
69	16.8287981	6.0000000							
	16.3242929	6.0000000	-.0709402	.9949675	.00000	-1.00000	.2478027	.0000000	.0000000
70	15.8197880	6.0000000							
	15.3627670	6.0000000	-.0708885	.9949748	.00000	-1.00000	.2370977	-.0000001	.0000000
71	14.9057460	6.0000000							
	14.5248954	6.0000000	-.0707858	.9949894	.00000	-1.00000	.2275006	-.0000001	.0000000
72	14.1440450	6.0000000							
	13.8266695	6.0000000	-.0706158	.9950134	.00000	-1.00000	.2195200	.0000000	.0000000
73	13.5092945	6.0000000							
	13.2448145	6.0000000	-.0703674	.9950484	.00000	-1.00000	.2128412	.0000001	.0000000
74	12.9603350	6.0000000							
	12.7599355	6.0000000	-.0700341	.9950952	.00000	-1.00000	.2072669	.0000000	.0000000
75	12.5395360	6.0000000							
	12.3558694	6.0000000	-.0696086	.9951546	.00000	-1.00000	.2026281	.0000000	.0000000
76	12.1722029	6.0000000							
	12.0191474	6.0000000	-.0690068	.9952381	.00000	-1.00000	.1988004	.0000001	.0000000
77	11.8660920	6.0000000							
	11.7385459	6.0000000	-.0688061	.9952657	.00000	-1.00000	.1958302	.0000001	.0000000
78	11.6109999	6.0000000							
	11.4849260	5.9993703	-.0669228	.9955214	-.00763	-.99997	.1937370	.0000001	.0000000
79	11.3588570	5.9980749							
	11.2336416	5.9957247	-.0655741	.9957000	-.02232	-.99975	.1899037	.0000001	.0000000
80	11.1084460	5.9924832							
	10.9840175	5.9884013	-.0660531	.9956370	-.03613	-.99935	.1842953	.0000001	.0000000
81	10.8596190	5.9834879							
	10.7359110	5.9777992	-.0660228	.9956413	-.04906	-.99880	.1776550	.0000000	.0000000
82	10.6122410	5.9713367							
	10.4891906	5.9641594	-.0660925	.9956318	-.06114	-.99813	.1702914	.0000000	.0000000
83	10.3661840	5.9562637							
	10.2437339	5.9477100	-.0662436	.9956118	-.07239	-.99738	.1624530	.0000000	.0000000
84	10.1213320	5.9384915							
	9.9994266	5.9286683	-.0664616	.9955829	-.08283	-.99656	.1543663	.0000001	.0000000
85	9.8775721	5.9182321							
	9.7561605	5.9072418	-.0667358	.9955463	-.09246	-.99572	.1462218	.0000001	.0000000
86	9.6348013	5.8956808							
	9.5138347	5.8836297	-.0670596	.9955030	-.10131	-.99485	.1381703	.0000000	.0000000
87	9.3929205	5.8710565							
	9.2723523	5.8580235	-.0674286	.9954534	-.10940	-.99400	.1303261	-.0000000	.0000000
88	9.1518356	5.8445236							
	9.0316215	5.8306080	-.0678400	.9953977	-.11673	-.99316	.1227705	.0000000	.0000000

POTENTIAL FLOW – EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
89	8.9114568	5.8162723							
	8.7915541	5.8015628	-.0682916	.9953363	-.12332	-.99237	.1155574	.0000001	.0000000
90	8.6716980	5.7864783							
	8.5520655	5.7710621	-.0687868	.9952684	-.12918	-.99162	.1087187	-.0000000	.0000000
91	8.4324759	5.7553149							
	8.3130736	5.7392761	-.0693234	.9951943	-.13432	-.99094	.1022685	-.0000000	.0000000
92	8.1937102	5.7229496							
	8.0744991	5.7063711	-.0699047	.9951133	-.13876	-.99033	.0962083	-.0000000	.0000000
93	7.9553225	5.6895475							
	7.8362648	5.6725104	-.0705332	.9950251	-.14250	-.98979	.0905303	-.0000000	.0000000
94	7.7172364	5.6552704							
	7.5982949	5.6378548	-.0712099	.9949292	-.14555	-.98935	.0852203	-.0000000	.0000000
95	7.4793769	5.6202781							
	7.3605146	5.6025631	-.0719362	.9948252	-.14791	-.98900	.0802599	-.0000000	.0000000
96	7.2416701	5.5847288							
	7.1228537	5.5667928	-.0727153	.9947125	-.14958	-.98875	.0756281	-.0000000	.0000000
97	7.0040429	5.5487792							
	6.8852304	5.5306991	-.0735358	.9945925	-.15058	-.98863	.0713019	-.0000000	.0000000
98	6.7664229	5.5125853							
	6.6475802	5.4944441	-.0744106	.9944631	-.15090	-.98855	.0672640	-.0000001	.0000000
99	6.5287375	5.4763033							
	6.4099004	5.4581881	-.0753539	.9943218	-.15054	-.98860	.0634882	-.0000001	.0000000
100	6.2910579	5.4401098							
	6.1722546	5.4221053	-.0763430	.9941718	-.14950	-.98876	.0599536	-.0000001	.0000000
101	6.0534394	5.4041809							
	5.9346336	5.3863657	-.0773721	.9940136	-.14779	-.98902	.0566435	-.0000001	.0000000
102	5.8158097	5.3686723							
	5.6969648	5.3511245	-.0784452	.9938464	-.14539	-.98937	.0535375	-.0000001	.0000000
103	5.5780960	5.3337401							
	5.4591765	5.3165385	-.0795596	.9936703	-.14231	-.98982	.0506170	-.0000000	.0000000
104	5.3402255	5.2995417							
	5.2211922	5.2827654	-.0807107	.9934858	-.13853	-.99036	.0478647	-.0000001	.0000000
105	5.1021244	5.2662359							
	4.9829406	5.2499650	-.0818943	.9932933	-.13406	-.99097	.0452650	-.0000000	.0000000
106	4.8637178	5.2339833							
	4.7443452	5.2182993	-.0831073	.9930932	-.12889	-.99166	.0428034	-.0000001	.0000000
107	4.6249295	5.2029475							
	4.5053288	5.1879333	-.0843447	.9928860	-.12300	-.99241	.0404665	-.0000001	.0000000
108	4.3856817	5.1732945							
	4.2658126	5.1590343	-.0856044	.9926719	-.11639	-.99320	.0382422	-.0000001	.0000000
109	4.1458942	5.1451945							
	4.0257148	5.1317750	-.0868839	.9924512	-.10905	-.99404	.0361198	-.0000001	.0000000
110	3.9054843	5.1188215							
	3.7849513	5.1063317	-.0881841	.9922236	-.10095	-.99489	.0340895	-.0000000	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
111	3.6643663	5.0943545							
	3.5434346	5.0828863	-.0895079	.9919883	-.09210	-.99575	.0321430	-.0000001	.0000000
112	3.4224512	5.0719765							
	3.3010736	5.0616266	-.0908643	.9917437	-.08248	-.99659	.0302730	-.0000001	.0000000
113	3.1796457	5.0518844							
	3.0577727	5.0427473	-.0922712	.9914860	-.07206	-.99740	.0284733	-.0000001	.0000000
114	2.9358520	5.0342735							
	2.8134310	5.0264507	-.0937601	.9912090	-.06084	-.99815	.0267381	-.0000000	.0000000
115	2.6979667	5.0193437							
	2.5679423	5.0129486	-.0953894	.9909309	-.04880	-.99881	.0250603	-.0000000	.0000000
116	2.4448805	5.0073202							
	2.3211935	5.0024623	-.0972663	.9905393	-.03592	-.99935	.0234279	-.0000000	.0000000
117	2.1974770	4.9984267							
	2.0730640	4.9952242	-.0997472	.9900505	-.02219	-.99975	.0218179	-.0000001	.0000000
118	1.9485315	4.9929024							
	1.8233214	4.9912016	-.1034009	.9893083	-.00759	-.99997	.0200782	-.0000001	.0000000
119	1.6980000	4.9910003							
	1.6122447	4.9923773	-.1082888	.9882735	.02530	-.99968	.0181800	-.0000001	.0000000
120	1.5265295	4.9953400							
	1.4451099	5.0034653	-.1119785	.9874608	.07516	-.99717	.0165330	-.0000000	.0000000
121	1.3638420	5.0076025							
	1.2867347	5.0162761	-.1137516	.9870606	.12396	-.99229	.0152464	-.0000000	.0000000
122	1.2098634	5.0268385							
	1.1370124	5.0386708	-.1152594	.9867153	.17254	-.98500	.0141029	-.0000000	.0000000
123	1.0644770	5.0523051							
	.9958170	5.0669929	-.1165245	.9864221	.22163	-.97513	.0130561	.0000000	.0000000
124	.9275536	5.0834258							
	.8630218	5.1007380	-.1176746	.9861527	.27196	-.96231	.0120750	.0000000	.0000000
125	.7989744	5.1197639							
	.7385202	5.1395319	-.1187964	.9858874	.32423	-.94598	.0111366	.0000000	.0000000
126	.6785504	5.1610051							
	.6222442	5.1831179	-.1199546	.9856109	.37921	-.92531	.0102212	-.0000000	.0000000
127	.5665420	5.2069486							
	.5141859	5.2313510	-.1211963	.9853115	.43766	-.89914	.0093101	.0000000	.0000000
128	.4626816	5.2575035							
	.4154019	5.2836321	-.1225363	.9849849	.49976	-.86617	.0083929	.0000000	.0000000
129	.3691185	5.3114873							
	.3262277	5.3396325	-.1239588	.9846342	.56589	-.82448	.0074515	.0000000	.0000000
130	.2845438	5.3695360							
	.2462618	5.3996398	-.1254130	.9842716	.63658	-.77121	.0064618	.0000000	.0000000
131	.2094480	5.4315221							
	.1761083	5.4634883	-.1267736	.9839285	.71141	-.70277	.0054004	.0000000	.0000000
132	.1445518	5.4972162							
	.1176815	5.5294433	-.1277687	.9836752	.78674	-.61728	.0042798	.0000000	.0000000

POTENTIAL FLOW - FODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
133	.0927733	5.5632098							
	.0710843	5.5969337	-.1280763	.9835965	.85888	-.51218	.0030997	.0000001	.0000000
134	.0517239	5.6320462							
	.0356628	5.6669440	-.1273103	.9837921	.92349	-.38363	.0018624	.0000001	.0000000
135	.0222693	5.7029500							
	.0122057	5.7384667	-.1252442	.9843139	.97232	-.23365	.0006470	.0000001	.0000000
136	.0050333	5.7746781							
	.0010348	5.8072249	-.1243463	.9845380	.99704	-.07683	-.0003345	.0000000	.0000000
137	.0000000	5.8400003							
	.0027027	5.8743638	-.1247120	.9844469	.98884	.14901	-.0020998	.0000001	.0000000
138	.0102465	5.9079982							
	.0232597	5.9373530	-.1133500	.9871518	.88255	.47022	-.0055131	.0000000	.0000000
139	.0403651	5.9645276							
	.0596903	5.9879149	-.0937994	.9912017	.73832	.67445	-.0077592	-.0000000	.0000000
140	.0812386	6.0092714							
	.1021562	6.0271011	-.0777310	.9939579	.62532	.78037	-.0089678	.0000000	.0000000
141	.1241164	6.0436297							
	.1491852	6.0605449	-.0655020	.9957095	.54000	.84167	-.0096896	-.0000000	.0000000
142	.1750130	6.0752820							
	.2038299	6.0922922	-.0555214	.9969174	.46974	.88281	-.0102362	.0000000	.0000000
143	.2332099	6.1072499							
	.2655795	6.1224563	-.0474323	.9977502	.41208	.91115	-.0106063	-.0000000	.0000000
144	.2983746	6.1367220							
	.3342397	6.1512396	-.0408207	.9983337	.36425	.93130	-.0109424	.0000000	.0000000
145	.3704374	6.1649070							
	.4098453	6.1788353	-.0353480	.9987505	.32392	.94609	-.0112472	-.0000000	.0000000
146	.4495205	6.191 830							
	.4925903	6.2053987	-.0307569	.9990540	.28933	.95723	-.0115415	.0000000	.0000000
147	.5358801	6.2180863							
	.5827839	6.2310433	-.0268558	.9992788	.25919	.96583	-.0118393	.0000000	.0000000
148	.6298728	6.2433105							
	.6808255	6.2558419	-.0235028	.9994476	.23251	.97259	-.0121512	.0000000	.0000000
149	.7319366	6.2677103							
	.7871896	6.2798309	-.0205918	.9995760	.20855	.97801	-.0124856	.0000000	.0000000
150	.8425804	6.2913041							
	.9024184	6.3030087	-.0180419	.9996745	.18673	.98241	-.0128500	.0000000	.0000000
151	.9623779	6.3140746							
	1.0271180	6.3253413	-.0157910	.9997506	.16659	.98603	-.0132514	.0000001	.0000000
152	1.0919661	6.3359682							
	1.1619567	6.3467551	-.0137909	.9998098	.14773	.98903	-.0136970	.0000000	.0000000
153	1.2320445	6.3568918							
	1.3076668	6.3671342	-.0120026	.9998560	.12982	.99154	-.0141944	.0000000	.0000000
154	1.3833770	6.3767059							
	1.4650454	6.3863122	-.0103956	.9998919	.11254	.99365	-.0147516	.0000000	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. 8FOC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
155	1.5467935	6.3952146							
	1.6349574	6.4040580	-.0089445	.9999200	.09555	.99542	-.0153780	.0000000	.0000000
156	1.7231938	6.4121470							
	1.8183392	6.4200526	-.0076292	.9999418	.07846	.99692	-.0160850	-.0000000	.0000000
157	1.9135500	6.4271275							
	2.0162014	6.4338492	-.0064275	.9999587	.06071	.99816	-.0168878	.0000000	.0000000
158	2.1189107	6.4396189							
	2.2296323	6.4447989	-.0054554	.9999702	.04138	.99914	-.0178362	-.0000000	.0000000
159	2.3404330	6.4487910							
	2.4606907	6.4515117	-.0044676	.9999800	.01749	.99985	-.0189796	.0000000	.0000000
160	2.5810000	6.4530003							
	2.7100000	6.4530000	-.0030876	.9999905	.00000	1.00000	-.0206284	.0000000	.0000000
161	2.8390000	6.4530000							
	2.9680000	6.4530003	-.0024725	.9999939	.00000	1.00000	-.0222813	-.0000000	.0000000
162	3.0970000	6.4530000							
	3.2260000	6.4530003	-.0017980	.9999968	.00000	1.00000	-.0239276	-.0000000	.0000000
163	3.3550000	6.4530000							
	3.4839999	6.4530000	-.0012256	.9999985	.00000	1.00000	-.0256285	-.0000000	.0000000
164	3.6129999	6.4530000							
	3.7419999	6.4530000	-.0007209	.9999995	.00000	1.00000	-.0274090	-.0000000	.0000000
165	3.8709999	6.4530000							
	3.9999999	6.4530000	-.0002700	.9999999	.00000	1.00000	-.0292866	-.0000001	.0000000
166	4.1289999	6.4530000							
	4.2579998	6.4530000	.0001376	1.0000000	.00000	1.00000	-.0312765	-.0000000	.0000000
167	4.3869998	6.4530000							
	4.5159998	6.4530000	.0005093	.9999997	.00000	1.00000	-.0333932	-.0000000	.0000000
168	4.6449998	6.4530000							
	4.7739998	6.4530000	.0008508	.9999993	.00000	1.00000	-.0356518	-.0000001	.0000000
169	4.9029998	6.4530000							
	5.0319998	6.4530000	.0011672	.9999986	.00000	1.00000	-.0380679	-.0000001	.0000000
170	5.1609997	6.4530000							
	5.2899997	6.4530003	.0014620	.9999979	.00000	1.00000	-.0406580	-.0000001	.0000000
171	5.4189997	6.4530000							
	5.5479996	6.4530000	.0017365	.9999970	.00000	1.00000	-.0434400	-.0000001	.0000000
172	5.6769996	6.4530003							
	5.8059996	6.4530003	.0019990	.9999960	.00000	1.00000	-.0464331	-.0000002	.0000000
173	5.9349996	6.4530003							
	6.0639995	6.4530000	.0022458	.9999950	.00000	1.00000	-.0496579	-.0000001	.0000000
174	6.1929995	6.4530003							
	6.3219995	6.4530003	.0024810	.9999938	.00000	1.00000	-.0531364	-.0000001	.0000000
175	6.4509995	6.4530000							
	6.5799995	6.4530003	.0027058	.9999927	.00000	1.00000	-.0568917	-.0000000	.0000000
176	6.7089995	6.4530000							
	6.8379995	6.4530003	.0029218	.9999915	.00000	1.00000	-.0609485	-.0000000	.0000000

POTENTIAL FLOW - FODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
177	6.9669994	6.4530000							
	7.0959994	6.4530000	.0031301	.9999902	.00000	1.00000	-.0653317	-.0000001	.0000000
178	7.2249994	6.4530000							
	7.3539994	6.4530000	.0033317	.9999889	.00000	1.00000	-.0700664	-.0000001	.0000000
179	7.4829993	6.4530000							
	7.6119993	6.4530000	.0035278	.9999876	.00000	1.00000	-.0751766	-.0000001	.0000000
180	7.7409993	6.4530000							
	7.8699992	6.4530000	.0037193	.9999862	.00000	1.00000	-.0806842	-.0000000	.0000000
181	7.9989992	6.4530000							
	8.1279991	6.4530000	.0039073	.9999847	.00000	1.00000	-.0866066	-.0000003	.0000000
182	8.2569991	6.4530000							
	8.3859991	6.4530000	.0040918	.9999833	.00000	1.00000	-.0929543	-.0000002	.0000000
183	8.5149990	6.4530000							
	8.6439990	6.4530000	.0042746	.9999817	.00000	1.00000	-.0997279	-.0000002	.0000000
184	8.7729989	6.4530000							
	8.9019989	6.4530000	.0044557	.9999802	.00000	1.00000	-.1069131	-.0000003	.0000000
185	9.0309988	6.4530000							
	9.1599988	6.4530000	.0046360	.9999785	.00000	1.00000	-.1144764	-.0000002	.0000000
186	9.2889987	6.4530000							
	9.4179987	6.4530000	.0048160	.9999768	.00000	1.00000	-.1223589	-.0000003	.0000000
187	9.5469986	6.4530000							
	9.6759986	6.4530000	.0049959	.9999751	.00000	1.00000	-.1304701	-.0000003	.0000000
188	9.8049985	6.4530000							
	9.9339982	6.4530000	.0051751	.9999732	.00000	1.00000	-.1386828	-.0000003	.0000000
189	10.0629981	6.4530000							
	10.1919980	6.4530000	.0053539	.9999713	.00000	1.00000	-.1468287	-.0000004	.0000000
190	10.3209980	6.4530000							
	10.4499979	6.4530000	.0055303	.9999694	.00000	1.00000	-.1546975	-.0000003	.0000000
191	10.5789980	6.4530000							
	10.7079979	6.4530000	.0057739	.9999675	.00000	1.00000	-.1620423	-.0000004	.0000000
192	10.8369980	6.4530000							
	10.9659979	6.4530000	.0058673	.9999656	.00000	1.00000	-.1685916	-.0000004	.0000000
193	11.0949980	6.4530000							
	11.2239980	6.4530000	.0059769	.9999643	.00000	1.00000	-.1740825	-.0000004	.0000000
194	11.3529980	6.4530000							
	11.4819989	6.4530000	.0060220	.9999637	.00000	1.00000	-.1783603	-.0000004	.0000000
195	11.6109999	6.4530000							
	11.7399999	6.4530000	.0061708	.9999619	.00000	1.00000	-.1817134	-.0000005	.0000000
196	11.8690000	6.4530000							
	12.0237999	6.4530000	.0064764	.9999586	.00000	1.00000	-.1848743	-.0000004	.0000000
197	12.1786000	6.4530000							
	12.3643600	6.4530000	.0067195	.9999548	.00000	1.00000	-.1685298	-.0000006	.0000000
198	12.5501200	6.4530000							
	12.7730319	6.4530000	.0070072	.9999539	.00000	1.00000	-.1928828	-.0000005	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
199	12.9959440	6.4530000							
	13.2634380	6.4530000	.0073467	.9999460	.00000	1.00000	-.1981204	-.0000007	.0000000
200	13.5309319	6.4530000							
	13.8519255	6.4530000	.0077652	.9999397	.00000	1.00000	-.2043972	-.0000004	.0000000
201	14.1729190	6.4530000							
	14.5581110	6.4530000	.0082884	.9999313	.00000	1.00000	-.2118984	-.0000006	.0000000
202	14.9433030	6.4530000							
	15.4055330	6.4530000	.0089515	.9999199	.00000	1.00000	-.2208345	-.0000006	.0000000
203	15.8677630	6.4530000							
	16.3710690	6.4530000	.0097635	.9999047	.00000	1.00000	-.2309082	-.0000003	.0000000
204	16.8743751	6.4530000							
	17.3776810	6.4530000	.0106895	.9998857	.00000	1.00000	-.2412687	-.0000005	.0000000
205	17.8809869	6.4530000							
	18.3842928	6.4530000	.0117149	.9998628	.00000	1.00000	-.2514658	-.0000006	.0000000
206	18.8875990	6.4530000							
	19.3909049	6.4530000	.0128594	.9998346	.00000	1.00000	-.2614795	-.0000005	.0000000
207	19.8942111	6.4530000							
	20.3975165	6.4530000	.0141497	.9997998	.00000	1.00000	-.2712868	-.0000003	.0000000
208	20.9008219	6.4530000							
	21.4041278	6.4530000	.0156185	.9997561	.00000	1.00000	-.2808600	-.0000003	.0000000
209	21.9074340	6.4530000							
	22.4107399	6.4530000	.0173052	.9997005	.00000	1.00000	-.2901654	-.0000004	.0000000
210	22.9140460	6.4530000							
	23.4173520	6.4530000	.0192637	.9996289	.00000	1.00000	-.2991611	-.0000001	.0000000
211	23.9206581	6.4530000							
	24.4239640	6.4530000	.0215622	.9995351	.00000	1.00000	-.3077947	-.0000003	.0000000
212	24.9272699	6.4530000							
	25.4305758	6.4530000	.0242956	.9994097	.00000	1.00000	-.3159988	-.0000002	.0000000
213	25.9338820	6.4530000							
	26.4371874	6.4530000	.0275927	.9992387	.00000	1.00000	-.3236838	-.0000002	.0000000
214	26.9404931	6.4530000							
	27.4437990	6.4530000	.0316386	.9989990	.00000	1.00000	-.3307257	-.0000003	.0000000
215	27.9471049	6.4530000							
	28.4504108	6.4530000	.0367105	.9986524	.00000	1.00000	-.3369421	-.0000004	.0000000
216	28.9537170	6.4530000							
	29.4570229	6.4530000	.0432382	.9981305	.00000	1.00000	-.3420401	-.0000003	.0000000
217	29.9603291	6.4530000							
	30.4636350	6.4530000	.0519308	.9973032	.00000	1.00000	-.3455088	.0000003	.0000000
218	30.9669411	6.4530000							
	31.4702466	6.4530000	.0640552	.9958969	.00000	1.00000	-.3463740	.0000002	.0000000
219	31.9735520	6.4530000							
	32.4768577	6.4530000	.0821169	.9932568	.00000	1.00000	-.3426306	.0000003	.0000000
220	32.9801641	6.4530000							
	33.4834700	6.4530000	.1119268	.9874724	.00000	1.00000	-.3299290	.0000008	.0000000

POTENTIAL FLOW - CODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
221	33.9867759	6.4530000							
	34.4900818	6.4530000	.1708332	.9708160	.00000	1.00000	-.2984254	.0000007	.0000000
222	34.9933882	6.4530000							
	35.4966941	6.4530000	.2925140	.9144356	.00000	1.00000	-.2253676	.0000007	.0000000
223	36.0000000	6.4530000							

ADDED MASS = .0000000 VOLUME = 1335.0865936 SUM (T)(DELTA S) = 3.6488886

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 .2-BODY CASE NO. BFOCI PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
1	8.0110000	.0000000							
	8.0152385	.1151024	-2.0503038	-3.2037458	.99742	.07174	2.1751735	-.0000026	.0000000
2	8.0275149	.2296225							
	8.0482578	.3442699	-5.9906795	-34.8882408	.97723	.21217	2.1246722	-.0000017	.0000000
3	8.0769252	.4571968							
	8.1128740	.5668563	-9.6314246	-91.7643433	.93964	.34216	2.0324268	-.0000002	.0000000
4	8.1558563	.6739545							
	8.2057551	.7786680	-12.8098564	-163.0924206	.88942	.45709	1.9090642	-.0000024	.0000000
5	8.2618482	.8801982							
	8.3240924	.9789350	-15.5014868	-239.2960911	.83099	.55629	1.7658075	-.0000012	.0000000
6	8.3916585	1.0741090							
	8.4645996	1.1662226	-17.7163205	-312.8680115	.76826	.64013	1.6125728	-.0000033	.0000000
7	8.5420380	1.2545990							
	8.6241082	1.3397385	-19.4990563	-379.2131958	.70414	.71006	1.4567177	-.0000014	.0000000
8	8.7099422	1.4210927							
	8.7967980	1.4967089	-20.8885713	-435.3324089	.64148	.76714	1.3055241	-.0000013	.0000000
9	8.8865939	1.5688088							
	8.9602898	1.6383442	-21.9625387	-481.3531036	.58112	.81382	1.1612588	-.0000017	.0000000
10	9.0764732	1.7043962							
	9.1759719	1.7676933	-22.7973968	-518.7213899	.52235	.85273	1.0222057	-.0000014	.0000000
11	9.2775625	1.8275751							
	9.3819519	1.8846010	-23.4319654	-548.0569992	.46548	.88506	.8892191	-.0000031	.0000000
12	9.4880913	1.9382993							
	9.5965809	1.9890973	-23.9005263	-570.2351532	.41060	.91182	.7623706	-.0000011	.0000000
13	9.7065265	2.0366619							
	9.8184350	2.0813177	-24.2311416	-586.1482162	.35762	.93387	.6412745	-.0000015	.0000000
14	9.9315463	2.1228321							
	10.0462868	2.1614498	-24.4454463	-596.5798416	.30639	.95191	.5252029	-.0000008	.0000000
15	10.1620110	2.1970111							
	10.2790741	2.2296982	-24.5587296	-602.1311951	.25669	.96649	.4132395	-.0000009	.0000000
16	10.3969290	2.2594033							
	10.5158712	2.2862600	-24.5794437	-603.1490479	.20830	.97807	.3042709	-.0000005	.0000000
17	10.6354350	2.3101971							
	10.7558620	2.3313097	-24.5080717	-599.6455765	.16095	.98696	.1970634	-.0000020	.0000000
18	10.8767570	2.3495520							
	10.9983147	2.3649888	-24.3339238	-591.1398468	.11442	.99343	.0902076	-.0000006	.0000000
19	11.1201990	2.3775911							
	11.2425621	2.3873996	-24.0281744	-576.3531647	.06845	.99765	-.0179614	-.0000003	.0000000
20	11.3651180	2.3943955							
	11.4880365	2.3981811	-23.3989158	-546.5092545	.02279	.99974	-.1306317	-.0000001	.0000000
21	11.6109999	2.4000000							
	11.7385459	2.4000003	-22.5334795	-506.7576942	.00000	1.00000	-.1697340	.0000001	.0000000
22	11.8660920	2.4000000							
	12.0191474	2.4000000	-21.8715669	-477.3655243	.00000	1.00000	-.1335702	.0000003	.0000000

POTENTIAL FLOW – EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOCI PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
23	12.1722029	2.4000000							
	12.3558694	2.4000000	-21.4874294	-460.7096176	.00000	1.00000	-.1014736	-.0000001	.0000000
24	12.5395360	2.4000000							
	12.7599355	2.4000000	-21.2040441	-448.6114845	.00000	1.00000	-.0735085	.0000002	.0000000
25	12.9603350	2.4000000							
	13.2448145	2.4000000	-20.9966114	-439.8576851	.00000	1.00000	-.0500853	.0000004	.0000000
26	13.5092940	2.4000000							
	13.8266695	2.4000000	-20.8508916	-433.7596779	.00000	1.00000	-.0315711	.0000002	.0000000
27	14.1440450	2.4000000							
	14.5248954	2.4000000	-20.7554734	-429.7896729	.00000	1.00000	-.0180517	.0000003	.0000000
28	14.9057460	2.4000000							
	15.3627670	2.4000000	-20.6988704	-427.4432335	.00000	1.00000	-.0091467	.0000003	.0000000
29	15.8197880	2.4000000							
	16.3242929	2.4000000	-20.6702828	-426.2605896	.00000	1.00000	-.0041443	.0000003	.0000000
30	16.8287981	2.4000000							
	17.3333035	2.4000000	-20.6581028	-425.7572360	.00000	1.00000	-.0017952	.0000024	.0000000
31	17.8378091	2.4000000							
	18.3423140	2.4000000	-20.6532116	-425.5551491	.00000	1.00000	-.0007619	.0000002	.0000000
32	18.8468189	2.4000000							
	19.3513243	2.4000000	-20.6512418	-425.4737854	.00000	1.00000	-.0003229	-.0000001	.0000000
33	19.8558300	2.4000000							
	20.3603354	2.4000000	-20.6504452	-425.4408875	.00000	1.00000	-.0001373	.0000001	.0000000
34	20.8648410	2.4000000							
	21.3693459	2.4000000	-20.6501265	-425.427719	.00000	1.00000	-.0000611	.0000001	.0000000
35	21.8738511	2.4000000							
	22.3783565	2.4000000	-20.6499796	-425.421653	.00000	1.00000	-.0000338	.0000003	.0000000
36	22.8828621	2.4000000							
	23.3873670	2.4000000	-20.6498826	-425.417648	.00000	1.00000	-.0000345	.0000005	.0000000
37	23.8918719	2.4000000							
	24.3963773	2.4000000	-20.6497326	-425.4114532	.00000	1.00000	-.0000635	.0000006	.0000000
38	24.9008830	2.4000000							
	25.4053879	2.4000000	-20.6493869	-425.3971748	.00000	1.00000	-.0001435	.0000009	.0000000
39	25.9098930	2.4000000							
	26.4143984	2.4000000	-20.6485209	-425.3614159	.00000	1.00000	-.0003358	.0000010	.0000000
40	26.9189041	2.4000000							
	27.4234090	2.4000000	-20.6463465	-425.2717318	.00000	1.00000	-.0007848	.0000015	.0000000
41	27.9279139	2.4000000							
	28.4324193	2.4000000	-20.6409066	-425.0470238	.00000	1.00000	-.0018156	.0000014	.0000000
42	28.9369249	2.4000000							
	29.4414299	2.4000000	-20.6273203	-424.4863396	.00000	1.00000	-.0041410	.0000016	.0000000
43	29.9459350	2.4000000							
	30.4504404	2.4000000	-20.5935135	-423.0927963	.00000	1.00000	-.0092674	.0000015	.0000000
44	30.9549460	2.4000000							
	31.4594514	2.4000000	-20.5098395	-419.6535149	.00000	1.00000	-.0202100	.0000016	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177 PAGE [illegible]

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
45	31.9639571	2.4000000							
	32.4684620	2.4000000	-20.3353639	-411.3378303	.00000	1.00000	-.0424513	.0000017	.0000000
46	32.9729671	2.4000000							
	33.4774718	2.4000000	-19.8203177	-391.8449936	.00000	1.00000	-.0842646	.0000019	.0000000
47	33.9819770	2.4000000							
	34.4864821	2.4000000	-18.7374024	-350.0902481	.00000	1.00000	-.1535240	.0000010	.0000000
48	34.9909878	2.4000000							
	35.4954939	2.4000000	-16.4645202	-270.0804253	.00000	1.00000	-.2493139	.0000007	.0000000
49	36.0000000	2.4000000							
50	36.0000000	6.0000000							
	35.4954939	6.0000000	26.2669439	-688.9523392	.00000	-1.00000	7.2949687	-.0000093	.0000000
51	34.9909878	6.0000000							
	34.4864821	6.0000000	22.6221566	-510.7619667	.00000	-1.00000	8.2444847	-.0000076	.0000000
52	33.9819770	6.0000000							
	33.4774718	6.0000000	21.3321800	-454.0519011	.00000	-1.00000	8.3228323	-.0000072	.0000000
53	32.9729671	6.0000000							
	32.4684620	6.0000000	20.9103580	-436.2430687	.00000	-1.00000	8.0636740	-.0000057	.0000000
54	31.9639571	6.0000000							
	31.4594516	6.0000000	20.7541504	-429.7347565	.00000	-1.00000	7.6438341	-.0000032	.0000000
55	30.9549460	6.0000000							
	30.4504404	6.0000000	20.6927698	-427.1937196	.00000	-1.00000	7.1334200	-.0000061	.0000000
56	29.9459350	6.0000000							
	29.4414299	6.0000000	20.6680160	-426.1668816	.00000	-1.00000	6.5658227	-.0000035	.0000000
57	28.9369249	6.0000000							
	28.4324193	6.0000000	20.6578557	-425.7470016	.00000	-1.00000	5.9591110	-.0000023	.0000000
58	27.9279139	6.0000000							
	27.4234090	6.0000000	20.6536047	-425.5713882	.00000	-1.00000	5.3240879	-.0000017	.0000000
59	26.9189341	6.0000000							
	26.4143984	6.0000000	20.6517842	-425.4961891	.00000	-1.00000	4.6677672	-.0000008	.0000008
60	25.9098930	6.0000000							
	25.4053879	6.0000000	20.6539635	-425.4622917	.00000	-1.00000	3.9950143	-.0000005	.0000000
61	24.9008830	6.0000000							
	24.3963773	6.0000000	20.6505735	-425.4461823	.00000	-1.00000	3.3093874	.0000004	.0000000
62	23.8918719	6.0000000							
	23.3873670	6.0000000	20.6503551	-425.4371643	.00000	-1.00000	2.6136073	-.0000014	.0000000
63	22.8828621	6.0000000							
	22.3783565	6.0000000	20.6502147	-425.4313560	.00000	-1.00000	1.9098258	-.0000011	.0000000
64	21.8738511	6.0000000							
	21.3693459	6.0000000	20.6500583	-425.4249039	.00000	-1.00000	1.1998027	-.0000002	.0000000
65	20.8648410	6.0000000							
	20.3603354	6.0000000	20.6497962	-425.4140816	.00000	-1.00000	.4850119	-.0000008	.0000000
66	19.8558300	6.0000000							

19.3513243	6.0000000	23.6492193	-425.3902550	.00000	-1.00000	-.2332773	-.0000003	.0000000

POTENTIAL FLOW - TODF RELEASE 2   DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0   3-BODY   CASE NO. PF0C1   PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
67	18.8468189	6.0000000							
	18.3423140	6.0000000	20.6478469	-425.3335803	.00000	-1.00000	-.9539803	.0000001	.0000000
68	17.8376091	6.0000000							
	17.3333035	6.0000000	20.6444738	-425.1942978	.00000	-1.00000	-1.6762193	-.0000006	.0000000
69	16.8287981	6.0000000							
	16.3242929	6.0000000	20.6361523	-424.8507767	.00000	-1.00000	-2.3994901	-.0000003	.0000000
70	15.8197880	6.0000000							
	15.3627670	6.0000000	20.6173067	-424.0733337	.00000	-1.00000	-3.0898967	.0000025	.0000000
71	14.9057460	6.0000000							
	14.5248954	6.0000000	20.5514371	-422.955535	.00000	-1.00000	-3.6938250	.0000015	.0000000
72	14.1440450	6.0000000							
	13.8266695	6.0000000	20.5232470	-420.2036667	.00000	-1.00000	-4.2010726	-.0000006	.0000000
73	13.5092940	6.0000000							
	13.2448145	6.0000000	20.4386971	-416.7403374	.00000	-1.00000	-4.6294466	-.0000007	.0000000
74	12.9603350	6.0000000							
	12.7599355	6.0000000	20.3261197	-412.1511383	.00000	-1.00000	-4.9934055	.0000001	.0000000
75	12.5395360	6.0000000							
	12.3556694	6.0000000	20.1848731	-406.4291000	.00000	-1.00000	-5.3044671	-.0000003	.0000000
76	12.1722029	6.0000000							
	12.0191474	6.0000000	20.0133317	-399.4001656	.00000	-1.00000	-5.5722531	-.0000020	.0000000
77	11.8660920	6.0000000							
	11.7385459	6.0000000	19.7865281	-390.5066910	.00000	-1.00000	-5.8091110	-.0000029	.0000000
78	11.6109999	6.0000000							
	11.4849260	5.9993708	19.4680920	-378.0066032	-.00763	-.99997	-6.0641055	-.0000012	.0000000
79	11.3588570	5.9980749							
	11.2336416	5.9957247	19.2521400	-369.6448936	-.02232	-.99975	-6.2803291	-.0000064	.0000000
80	11.1084460	5.9924832							
	10.9840175	5.9884013	19.1956897	-367.4744987	-.03613	-.99935	-6.4305039	-.0000048	.0000000
81	10.8596190	5.9834879							
	10.7359110	5.9777992	19.1655972	-366.3231141	-.04906	-.99887	-6.5314915	-.0000041	.0000000
82	10.6122410	5.9713367							
	10.4891906	5.9641594	19.1689653	-366.4492302	-.06114	-.99813	-6.5669178	-.0000035	.0000000
83	10.3661840	5.9562637							
	10.2437339	5.9477100	19.1979079	-367.5596657	-.07239	-.99738	-6.6017427	-.0000024	.0000000
84	10.1213320	5.9384915							
	9.9994266	5.9286683	19.2476163	-369.4707298	-.08283	-.99656	-6.5816472	-.0000055	.0000000
85	9.8775721	5.9182321							
	9.7561605	5.9072418	19.3147509	-372.0596308	-.09246	-.99572	-6.5325446	-.0000025	.0000000
86	9.6348013	5.8956888							
	9.5138347	5.8836297	19.3971779	-375.2505112	-.10131	-.99485	-6.4601182	-.0000053	.0000000
87	9.3929205	5.8710565							
	9.2723523	5.8580235	19.4934943	-378.9963188	-.10940	-.99400	-6.3695762	-.0000039	.0000000
88	9.1518356	5.8445236							
	9.0316215	5.8306080	19.6029313	-383.2749138	-.11673	-.99316	-6.2654700	-.0000015	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
89	8.9114568	5.8162720							
	8.7915541	5.8015628	19.7250879	-388.0790901	-.12332	-.99237	-6.1516881	-.0000056	.0000000
90	8.6716980	5.7864783							
	8.5520655	5.7710621	19.6601165	-393.4242249	-.12918	-.99162	-6.0314115	-.0000039	.0000000
91	8.4324759	5.7553149							
	8.3130736	5.7392761	20.0081108	-399.3244934	-.13432	-.99094	-5.9071987	-.0000053	.0000000
92	8.1937102	5.7229496							
	8.0744991	5.7063711	20.1695802	-405.8119459	-.13876	-.99033	-5.7810367	-.0000062	.0000000
93	7.9553225	5.6895475							
	7.8362648	5.6725104	20.3450415	-412.9207115	-.14250	-.98979	-5.6544393	-.0000060	.0000000
94	7.7172364	5.6552704							
	7.5982949	5.6378548	20.5349574	-420.6844749	-.14555	-.98935	-5.5285023	-.0000066	.0000000
95	7.4793769	5.6202781							
	7.3605146	5.6025631	20.7397645	-429.1378288	-.14791	-.98900	-5.4039998	-.0000050	.0000000
96	7.2416701	5.5847288							
	7.1228507	5.5667928	20.9599295	-438.3186417	-.14956	-.98875	-5.2814277	-.0000066	.0000000
97	7.0040429	5.5487792							
	6.8852304	5.5306991	21.1948531	-448.2217941	-.15058	-.98860	-5.1609964	-.0000063	.0000000
98	6.7664229	5.5125853							
	6.6475802	5.4944441	21.4450119	-458.8885307	-.15090	-.98855	-5.0432019	-.0000063	.0000000
99	6.5287375	5.4763030							
	6.4099004	5.4581881	21.7117169	-470.3986433	-.15054	-.98860	-4.9276944	-.0000055	.0000000
100	6.2910579	5.4401098							
	6.1722546	5.4221053	21.9930124	-482.6925926	-.14950	-.98876	-4.8143355	-.0000036	.0000000
101	6.0534394	5.4041809							
	5.9346336	5.3863657	22.2875786	-495.7361565	-.14779	-.98902	-4.7032270	-.0000035	.0000000
102	5.8158097	5.3686723							
	5.6969648	5.3511245	22.5951879	-509.5425148	-.14539	-.98937	-4.5940948	-.0000035	.0000000
103	5.5780960	5.3337401							
	5.4591755	5.3165385	22.9148862	-524.0920105	-.14231	-.98982	-4.4866801	-.0000054	.0000000
104	5.3402255	5.2995417							
	5.2211922	5.2827654	23.2455342	-539.3548584	-.13853	-.99036	-4.3807360	-.0000066	.0000000
105	5.1021244	5.2662359							
	4.9829406	5.2499650	23.5859587	-555.2974472	-.13406	-.99097	-4.2759078	-.0000050	.0000000
106	4.8637178	5.2339833							
	4.7443452	5.2182993	23.9350600	-571.8870926	-.12889	-.99166	-4.1720193	-.0000045	.0000000
107	4.6249295	5.2029475							
	4.5053288	5.1879330	24.2916944	-589.0864105	-.12300	-.99241	-4.0687954	-.0000047	.0000000
108	4.3856817	5.1732945							
	4.2658126	5.1590343	24.6550901	-606.8734665	-.11639	-.99320	-3.9660176	-.0000049	.0000000
109	4.1456942	5.1451945							
	4.0257148	5.1317750	25.0246897	-625.2350522	-.10905	-.99404	-3.8635205	-.0000055	.0000000
110	3.9054843	5.1188215							
	3.7849513	5.1063317	25.4006834	-644.1947098	-.10095	-.99489	-3.7611995	-.0000050	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
111	3.6643663	5.0943546							
	3.5434346	5.0828863	25.7841685	-663.8233419	-.09210	-.99575	-3.6590427	-.0000064	.0000000
112	3.4224512	5.0719786							
	3.3010736	5.0616266	26.1778257	-684.2785568	-.08248	-.99659	-3.5571535	-.0000048	.0000000
113	3.1796457	5.0518844							
	3.0577727	5.0427473	26.5869005	-705.8632736	-.07206	-.99740	-3.4557452	-.0000036	.0000000
114	2.9358520	5.0342705							
	2.8134310	5.0264507	27.0207820	-729.1226578	-.06084	-.99815	-3.3550844	-.0000051	.0000000
115	2.6909667	5.0193437							
	2.5679423	5.0129486	27.4964507	-755.0547943	-.04880	-.99881	-3.2553021	-.0000052	.0000000
116	2.4448805	5.0073202							
	2.3211935	5.0024623	28.0453975	-785.5443192	-.03592	-.99935	-3.1559286	-.0000055	.0000000
117	2.1974770	4.9984267							
	2.0730640	4.9952242	28.7511239	-825.6271210	-.02219	-.99975	-3.0549772	-.0000047	.0000000
118	1.9486315	4.9929024							
	1.8233214	4.9912016	29.8553639	-890.3427200	-.00759	-.99997	-2.9317088	-.0000047	.0000000
119	1.6980000	4.9910003							
	1.6122447	4.9923773	31.2920411	-978.1918335	.02530	-.99968	-2.7319790	-.0000034	.0000000
120	1.5265295	4.9953403							
	1.4451099	5.0004653	32.3368959	-1044.6748352	.07516	-.99717	-2.5142890	-.0000045	.0000000
121	1.3638420	5.0076025							
	1.2867347	5.0162761	32.9311140	-1081.4832916	.12396	-.99229	-2.3459731	-.0000038	.0000000
122	1.2078634	5.0268385							
	1.1370124	5.0386708	33.3691940	-1112.5030975	.17254	-.98500	-2.1961701	-.0000028	.0000000
123	1.0644770	5.0523051							
	.9958170	5.0669929	33.7735586	-1139.6532593	.22163	-.97513	-2.0584775	-.0000041	.0000000
124	.9275536	5.0834258							
	.8630218	5.1007380	34.1521034	-1165.3661652	.27196	-.96231	-1.9283289	-.0000026	.0000000
125	.7989744	5.1197639							
	.7385202	5.1395319	34.5316558	-1191.4352417	.32423	-.94598	-1.8020106	-.0000009	.0000000
126	.6786504	5.1610051							
	.6222442	5.1831179	34.9329805	-1219.3131256	.37921	-.92531	-1.6759954	.0000003	.0000000
127	.5665420	5.2069486							
	.5141859	5.2313510	35.3722796	-1250.1981659	.43766	-.89914	-1.5465758	.0000000	.0000000
128	.4626816	5.2575035							
	.4154019	5.2836321	35.8566987	-1284.6884916	.49976	-.86617	-1.4109059	.0000008	.0000000
129	.3691185	5.3114873							
	.3262277	5.3396325	36.3838124	-1322.7817993	.56589	-.82448	-1.2645064	.0000013	.0000000
130	.2845438	5.3695369							
	.2462618	5.3996398	36.9454947	-1363.9695740	.63658	-.77121	-1.1020418	.0000009	.0000000
131	.2094480	5.4315221							
	.1761083	5.4634883	37.5391715	-1405.9379425	.71141	-.70277	-.9172174	.0000005	.0000000
132	.1445518	5.4972162							
	.1176815	5.5294433	37.9966149	-1442.7427368	.78674	-.61728	-.7107459	-.0000006	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
133	.0927733	5.5632098							
	.0710843	5.5969337	38.3143959	-1466.[illegible]28894	.85888	-.51218	-.4821714	-.0000008	.0000000
134	.0517239	5.6320462							
	.0356628	5.6669440	38.3539586	-1470.0261383	.92349	-.38363	-.2333504	-.0000013	.0000000
135	.0222693	5.7029503							
	.0122057	5.7384667	38.0411987	-1446.1327972	.97232	-.23365	.0151514	-.0000003	.0000000
136	.0050333	5.7746781							
	.0010348	5.8072249	38.1347971	-1453.2627411	.99704	-.07683	.2061663	-.0000020	.0000000
137	.0000000	5.8400000							
	.0027027	5.8743638	38.6849570	-1495.5258942	.98884	.14931	.5960291	-.0000015	.0000000
138	.0102465	5.9079982							
	.0232597	5.9373530	35.6838741	-1272.3388672	.88255	.47022	1.4123307	-.0000010	.0000000
139	.0403651	5.9645276							
	.0596903	5.9879149	29.9429927	-895.5828094	.73832	.67445	1.9160218	-.0000035	.0000000
140	.0812386	6.0092714							
	.1021562	6.0271011	25.1288252	-630.4578552	.62532	.78037	2.1475414	-.0000014	.0000000
141	.1241164	6.0436297							
	.1491852	6.0605449	21.4462156	-458.9401627	.54000	.84167	2.2541889	-.0000020	.0000000
142	.1750100	6.0762820							
	.2038299	6.0922922	18.4326572	-338.7628517	.46974	.88281	2.3049669	.0000002	.0000000
143	.2332099	6.1072499							
	.2655795	6.1224563	15.9846358	-254.5085812	.41208	.91115	2.3246807	-.0000011	.0000000
144	.2983746	6.1367220							
	.3342397	6.1512396	13.9813701	-194.4787083	.36425	.93130	2.3273925	-.0000012	.0000000
145	.3704374	6.1649070							
	.4098453	6.1788353	12.3222646	-150.8382034	.32392	.94609	2.3212908	-.0000018	.0000000
146	.4495205	6.1919830							
	.4925903	6.2053967	10.9302605	-118.4705954	.28933	.95723	2.3111868	-.0000011	.0000000
[illegible]	.5358801	6.2180863							
	[illegible]	6.2310433	9.7479268	-94.0220766	.25919	.96583	2.3000142	-.0000005	.0000000
[illegible]	[illegible]	6.2433105							
	[illegible]	6.2558419	8.7325248	-75.2569885	.23251	.97259	2.2896430	-.0000005	.0000000
[illegible]	[illegible]	6.2677103							
	[illegible]	6.2798304	7.8520719	-60.6550326	.20855	.97801	2.2813190	-.0000005	.0000000
[illegible]	[illegible]	6.2913041							
	[illegible]	6.3030087	7.0821669	-49.1570868	.18673	.98241	2.2759397	-.0000006	.0000000
[illegible]	[illegible]	6.3140746							
	[illegible]	6.3253413	6.4040727	-40.0121469	.16659	.98603	2.2741652	-.0000022	.0000000
[illegible]	[illegible]	6.3359682							
	[illegible]	6.3467551	5.8031106	-32.6760926	.14773	.98903	2.2765153	-.0000001	.0000000
[illegible]	1.2320445	6.3568918							
	1.3076666	6.3671342	5.2675852	-26.7474539	.12982	.99154	2.2834017	-.0000004	.0000000
154	1.3833770	6.3767059							
	1.4650454	6.3863122	4.7881747	-21.9266167	.11254	.99365	2.2951516	.0000011	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 3.0 2-BODY CASE NO. BF0C1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	T1	CP	SIN A	COS A	SIGMA	N	PHI
155	1.5467935	6.3952146							
	1.6349574	6.4040580	4.3571663	-17.9848979	.09555	.99542	2.3120536	.0000016	.0000000
156	1.7231928	6.4121470							
	1.8183392	6.4200526	3.9682114	-14.7467312	.07846	.99692	2.3344372	.0000025	.0000000
157	1.9135500	6.4271276							
	2.0162014	6.4338492	3.6151013	-12.0689576	.06071	.99816	2.3628141	.0000011	.0000000
158	2.1189107	6.4396189							
	2.2296323	6.4447989	3.3107062	-9.9607756	.04138	.99914	2.3976657	.0000034	.0000000
159	2.3404030	6.4487910							
	2.4606907	6.4515117	3.0047376	-8.0284482	.01749	.99985	2.4528143	.0000028	.0000000
160	2.5810000	6.4530000							
	2.7100000	6.4530000	2.6271954	-5.9021554	.00000	1.00000	2.5576676	.0000027	.0000000
161	2.8390000	6.4530000							
	2.9680000	6.4530000	2.4133792	-4.8243989	.00000	1.00000	2.6605447	.0000044	.0000000
162	3.0970000	6.4530000							
	3.2260000	6.4530000	2.2148446	-3.9055368	.00000	1.00000	2.7539847	.0000032	.0000000
163	3.3550000	6.4530000							
	3.4839999	6.4530000	2.0503854	-3.2040801	.00000	1.00000	2.8454768	.0000054	.0000000
164	3.6129999	6.4530000							
	3.7419999	6.4530000	1.9096596	-2.6467996	.00000	1.00000	2.9374618	.0000047	.0000000
165	3.8709999	6.4530000							
	3.9999999	6.4530000	1.7874365	-2.1949294	.00000	1.00000	3.0311753	.0000069	.0000000
166	4.1289999	6.4530000							
	4.2579998	6.4530000	1.6831164	-1.8227977	.00000	1.00000	3.1273687	.0000055	.0000000
167	4.3869998	6.4530000							
	4.5159998	6.4530000	1.5850556	-1.5124013	.00000	1.00000	3.2265473	.0000069	.0000000
168	4.6449998	6.4530000							
	4.7739998	6.4530000	1.5002469	-1.2507407	.00000	1.00000	3.3290814	.0000069	.0000000
169	4.9029998	6.4530000							
	5.0319998	6.4530000	1.4241197	-1.0281168	.00000	1.00000	3.4352590	.0000057	.0000000
170	5.1609997	6.4530000							
	5.2899997	6.4530000	1.3554201	-.8371638	.00000	1.00000	3.5453134	.0000065	.0000000
171	5.4189997	6.4530000							
	5.5479996	6.4530000	1.2931439	-.6722212	.00000	1.00000	3.6594391	.0000093	.0000000
172	5.6769996	6.4530000							
	5.8059996	6.4530000	1.2364616	-.5288373	.00000	1.00000	3.7777959	.0000092	.0000000
173	5.9349996	6.4530000							
	6.0639995	6.4530000	1.1846842	-.4034767	.00000	1.00000	3.9005063	.0000089	.0000000
174	6.1929995	6.4530000							
	6.3219995	6.4530000	1.1372294	-.2932908	.00000	1.00000	4.0276456	.0000083	.0000000
175	6.4509995	6.4530000							
	6.5799995	6.4530000	1.0936186	-.1960017	.00000	1.00000	4.1592280	.0000130	.0000000
176	6.7089995	6.4530000							
	6.8379995	6.4530000	1.0534242	-.1097025	.00000	1.00000	4.2951860	.0000125	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
177	6.9669994	6.4530000							
	7.0959994	6.4530000	1.0162975	-.0328607	.00000	1.00000	4.4353333	.0000114	.0000000
178	7.2249994	6.4530000							
	7.3539994	6.4530000	.9819417	.0357906	.00000	1.00000	4.5793292	.0000097	.0000000
179	7.4829993	6.4530000							
	7.6119993	6.4530000	.9500627	.0973808	.00000	1.00000	4.7266173	.0000116	.0000000
180	7.7409993	6.4530000							
	7.8699992	6.4530000	.9204491	.1527735	.00000	1.00000	4.8763728	.0000103	.0000000
181	7.9989992	6.4530000							
	8.1279991	6.4530000	.8928627	.2027962	.00000	1.00000	5.0274206	.0000154	.0000000
182	8.2569991	6.4530000							
	8.3859991	6.4530000	.8671713	.2480139	.00000	1.00000	5.1781579	.0000098	.0000000
183	8.5149990	6.4530000							
	8.6439990	6.4530000	.8431748	.2890563	.00000	1.00000	5.3264511	.0000125	.0000000
184	8.7729989	6.4530000							
	8.9019989	6.4530000	.8207521	.3263659	.00000	1.00000	5.4695532	.0000150	.0000000
185	9.0309988	6.4530000							
	9.1599988	6.4530000	.7997958	.3603267	.00000	1.00000	5.6040384	.0000161	.0000000
186	9.2889987	6.4530000							
	9.4179987	6.4530000	.7802094	.3912733	.00000	1.00000	5.7256061	.0000181	.0000000
187	9.5469986	6.4530000							
	9.6759986	6.4530000	.7619056	.4194999	.00000	1.00000	5.8293762	.0000115	.0000000
188	9.8049985	6.4530000							
	9.9339982	6.4530000	.7448276	.4452319	.00000	1.00000	5.9096741	.0000159	.0000000
189	10.0629981	6.4530000							
	10.1919980	6.4530000	.7289819	.4685854	.00000	1.00000	5.9604010	.0000176	.0000000
190	10.3209980	6.4530000							
	10.4499979	6.4530000	.7142551	.4898397	.00000	1.00000	5.9753634	.0000172	.0000000
191	10.5789980	6.4530000							
	10.7079979	6.4530000	.7006983	.5093219	.00000	1.00000	5.9488517	.0000195	.0000000
192	10.8369980	6.4530000							
	10.9659979	6.4530000	.6884616	.5260206	.00000	1.00000	5.8764480	.0000207	.0000000
193	11.0949980	6.4530000							
	11.2239980	6.4530000	.6787069	.5393542	.00000	1.00000	5.7563922	.0000213	.0000000
194	11.3529980	6.4530000							
	11.4819989	6.4530000	.6706339	.5502501	.00000	1.00000	5.5933201	.0000203	.0000000
195	11.6109999	6.4530000							
	11.7399999	6.4530000	.6589541	.5657794	.00000	1.00000	5.4033336	.0000169	.0000000
196	11.8690000	6.4530000							
	12.0237999	6.4530000	.6445681	.5845320	.00000	1.00000	5.1872078	.0000157	.0000000
197	12.1786000	6.4530000							
	12.3643630	6.4530000	.6307910	.6021028	.00000	1.00000	4.9336396	.0000168	.0000000
198	12.5501200	6.4530000							
	12.7730319	6.4530000	.6175654	.6186130	.00000	1.00000	4.6390345	.0000165	.0000000

POTENTIAL FLOW - FODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
199	12.9959440	6.4530000							
	13.2634380	6.4530000	.6039113	.6352912	.00000	1.00000	4.2952039	.0000120	.0000000
200	13.5309319	6.4530000							
	13.8519255	6.4530000	.5901098	.6517704	.00000	1.00000	3.8912528	.0000126	.0000000
201	14.1729190	6.4530000							
	14.5581110	6.4530000	.5770035	.6670670	.00000	1.00000	3.4134832	.0000120	.0000000
202	14.9433030	6.4530000							
	15.4055330	6.4530000	.5658407	.6798243	.00000	1.00000	2.8450604	.0000064	.0000000
203	15.8677630	6.4530000							
	16.3710690	6.4530000	.5586137	.6879507	.00000	1.00000	2.2001304	.0000048	.0000000
204	16.8743751	6.4530000							
	17.3776810	6.4530000	.5567130	.6900707	.00000	1.00000	1.5290603	.0000026	.0000000
205	17.8809869	6.4530000							
	18.3842928	6.4530000	.5604454	.6859009	.00000	1.00000	.8590164	.0000015	.0000000
206	18.8875990	6.4530000							
	19.3909049	6.4530000	.5699606	.6751449	.00000	1.00000	.1904479	-.0000009	.0000000
207	19.8942111	6.4530000							
	20.3975165	6.4530000	.5855872	.6570877	.00000	1.00000	-.4758456	-.0000023	.0000000
208	20.9008219	6.4530000							
	21.4041278	6.4530000	.6078889	.6304722	.00000	1.00000	-1.1388684	-.0000055	.0000000
209	21.9074340	6.4530000							
	22.4107399	6.4530000	.6377044	.5933332	.00000	1.00000	-1.7974539	-.0000047	.0000000
210	22.9140460	6.4530000							
	23.4173520	6.4530000	.6762735	.5426542	.00000	1.00000	-2.4502397	-.0000056	.0000000
211	23.9206581	6.4530000							
	24.4239640	6.4530000	.7253251	.4739035	.00000	1.00000	-3.0956027	-.0000095	.0000000
212	24.9272699	6.4530000							
	25.4305758	6.4530000	.7873293	.3801126	.00000	1.00000	-3.7315581	-.0000083	.0000000
213	25.9338820	6.4530000							
	26.4371874	6.4530000	.8657940	.2504008	.00000	1.00000	-4.3555974	-.0000106	.0000000
214	26.9404931	6.4530000							
	27.4437990	6.4530000	.9658430	.0671472	.00000	1.00000	-4.9644393	-.0000192	.0000000
215	27.9471049	6.4530000							
	28.4504108	6.4530000	1.0952145	-.1994948	.00000	1.00000	-5.5535981	-.0000224	.0000000
216	28.9537170	6.4530000							
	29.4570229	6.4530000	1.2660431	-.6028650	.00000	1.00000	-6.1166002	-.0000208	.0000000
217	29.9603291	6.4530000							
	30.4636350	6.4530000	1.4985439	-1.2456339	.00000	1.00000	-6.6434542	-.0000168	.0000000
218	30.9669411	6.4530000							
	31.4702466	6.4530000	1.8290493	-2.3454214	.00000	1.00000	-7.1174054	-.0000139	.0000000
219	31.9735520	6.4530000							
	32.4768577	6.4530000	2.3310531	-4.4338086	.00000	1.00000	-7.5074244	-.0000085	.0000000
220	32.9801641	6.4530000							
	33.4834700	6.4530000	3.1848735	-9.1434189	.00000	1.00000	-7.7482960	.0000010	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	TI	CP	SIN A	COS A	SIGMA	N	PHI
221	33.9867759	6.4530000							
	34.4900818	6.4530000	4.9703043	-23.7039242	.00000	1.00000	-7.6755620	-.0000091	.0000000
222	34.9933882	6.4530000							
	35.4966941	6.4530000	9.2691445	-84.9170399	.00000	1.00000	-6.7997958	-.0000002	.0000000
223	36.0000000	6.4530003							

ADDED MASS = .0000000 VOLUME = 1335.0865936 SUM (T)(DELTA S) = 288.2151604

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

THE FOLLOWING NUMBERS ARE THE CARD IMAGES THAT GET PUNCHED WHEN THERE IS PUNCHED OUTPUT

.80152085+01	.80482578+01	.81128740+01	.82057551+01
.83243924+01	.84645796+01	.86241382+01	.87967980+01
.89802898+01	.91759719+01	.93819519+01	.95965809+01
.98164350+01	.10046287+02	.10279074+02	.10515871+02
.10755862+02	.10998315+02	.11242562+02	.11488037+02
.11738546+02	.12019147+02	.12355869+02	.12759935+02
.13244815+02	.13826669+02	.14524895+02	.15362767+02
.16324293+02	.17333303+02	.18342314+02	.19351324+02
.20360335+02	.21369346+02	.22378356+02	.23387367+02
.24396377+02	.25405388+02	.26414398+02	.27423409+02
.28432419+02	.29441430+02	.30450440+02	.31459451+02
.32468462+02	.33477472+02	.34486482+02	.35495494+02
.35495494+02	.34486482+02	.33477472+02	.32468462+02
.31459451+02	.30450440+02	.29441430+02	.28432419+02
.27423409+02	.26414398+02	.25405388+02	.24396377+02
.23387367+02	.22378356+02	.21369346+02	.20360335+02
.19351324+02	.18342314+02	.17333303+02	.16324293+02
.15362767+02	.14524895+02	.13826669+02	.13244815+02
.12759935+02	.12355869+02	.12019147+02	.11738546+02
.11484926+02	.11233642+02	.10984017+02	.10735911+02
.10489191+02	.10243734+02	.99994266+01	.97561635+01
.95138347+01	.92723523+01	.90316215+01	.87915541+01
.85523655+01	.83130736+01	.80744991+01	.78362648+01
.75982949+01	.73605146+01	.71228507+01	.68852304+01
.66475802+01	.64099004+01	.61722546+01	.59346336+01
.56969648+01	.54591755+01	.52211922+01	.49829406+01
.47443452+01	.45053288+01	.42658126+01	.40257148+01
.37849513+01	.35434346+01	.33010736+01	.30577727+01
.28134310+01	.25679423+01	.23211935+01	.20730640+01
.18233214+01	.16122447+01	.14451099+01	.12867347+01
.11370124+01	.99581698+00	.86302184+00	.73852018+00
.62224419+00	.51418588+00	.41540193+00	.32622771+00
.24626183+00	.17610827+00	.11768152+00	.71084336-01
.35662759-01	.12205727-01	.10347799-02	.27027422-02
.23259684-01	.59690291-01	.10215616+00	.14916521+00
.20382987+00	.26557954+00	.33423974+00	.40984534+00
.49259026+00	.58278389+00	.68082546+00	.78718959+00
.90241843+00	.10271180+01	.11619567+01	.13076668+01
.14650454+01	.16349574+01	.18183392+01	.20162014+01
.22296323+01	.24606907+01	.27100000+01	.29680003+01
.32260000+01	.34839999+01	.37419999+01	.39999999+01
.42579998+01	.45159998+01	.47739998+01	.50319998+01
.52899997+01	.55479996+01	.58059996+01	.60639995+01
.63219995+01	.65799995+01	.68379995+01	.70959994+01
.73539994+01	.76119993+01	.78699992+01	.81279991+01
.83859991+01	.86439990+01	.89019989+01	.91599988+01
.94179987+01	.96759986+01	.99339982+01	.10191998+02
.10449998+02	.10707998+02	.10965998+02	.11223998+02
.11481999+02	.11740000+02	.12023800+02	.12364360+02
.12773032+02	.13263438+02	.13851925+02	.14558111+02
.15405533+02	.16371069+02	.17377681+02	.18384293+02
.19390905+02	.20397516+02	.21404128+02	.22410740+02
.23417352+02	.24423964+02	.25430576+02	.26437187+02

.27443799+02	.28450411+02	.29457023+02	.30463635+02
.31470247+02	.32476858+02	.33483470+02	.34490082+02
.35496694+02			
.11510245+00	.34426992+00	.56685627+00	.77866800+00
.97893503+00	.11652226+01	.13397385+01	.14967089+01
.16383442+01	.17676933+01	.18846010+01	.19890973+01
.20813177+01	.21614498+01	.22296982+01	.22662690+01
.23313097+01	.23649888+01	.23873996+01	.23981811+01
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.54944441+01	.54581881+01	.54221053+01	.53863657+01
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.50264507+01	.50129486+01	.50024620+01	.49952242+01
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.60922922+01	.61224563+01	.61512396+01	.61768353+01
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.63863122+01	.64040580+01	.64220526+01	.64338492+01
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.64530000+01	.64530000+01	.64530000+01	.64530000+01
.64530000+01	.64530000+01	.64530000+01	.64530000+01
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.64530000+01	.64530000+01	.64530000+01	.64530000+01
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.64530000+01	.64530000+01	.64530000+01	.64530000+01
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 .10535091+01 .10933995+01 .11236995+01 .11460566+01
 .11618156+01 .11720145+01 .11773832+01 .11783253+01
 .11748614+01 .11664785+01 .11517930+01 .11216049+01
 .10801007+01 .10483549+01 .10299242+01 .10163234+01
 .10063651+01 .99936734+00 .99478371+00 .99206452+00
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.96584304+00	.10952145+01	.12660431+01	.14985439+01
.18290493+01	.23310531+01	.31848735+01	.49703043+01
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POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

OFF-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
1	-.5000000	.0000000	1.0336591	.0000000	1.0336591	.0000000	.0000000
2	-.5000000	.7222222	1.0330983	-.0120317	1.0331663	-.6672470	.0000000
3	-.5000000	1.4444444	1.0310823	-.0253577	1.0313941	-1.4088063	.0000000
4	-.5000000	2.1666666	1.0264089	-.0414884	1.0272471	-2.3146879	.0000000
5	-.5000000	2.8888889	1.0161811	-.0623453	1.0180918	-3.5108408	.0000000
6	-.5000000	3.6111111	.9933906	-.0900277	.9974618	-5.1783831	.0000000
7	-.5000000	4.3333333	.9399686	-.1229830	.9479799	-7.4540875	.0000000
8	-.5000000	5.0555555	.8140050	-.1256514	.8236458	-8.7750275	.0000000
9	-.5000000	5.7777777	.6901083	.0774861	.6944447	6.4064007	.0000000
10	-.5000000	6.4999999	.8772401	.1858291	.8918156	12.0269439	.0000000
11	.0000000	.0000000	1.0503445	.0000000	1.0503445	.0000000	.0000000
12	.0000000	.6111111	1.0504256	-.0104217	1.0504773	-.5684384	.0000000
13	.0000000	1.2222222	1.0505719	-.0218462	1.0507991	-1.1913765	.0000000
14	.0000000	1.8333333	1.0504450	-.0354844	1.0510441	-1.9347386	.0000000
15	.0000000	2.4444444	1.0492753	-.0530308	1.0506146	-2.8932928	.0000000
16	.0000000	3.0555555	1.0453252	-.0772361	1.0481747	-4.2257433	.0000000
17	.0000000	3.6666666	1.0342607	-.1130684	1.0404229	-6.2389638	.0000000
18	.0000000	4.2777777	1.0034192	-.1702157	1.0177541	-9.6277568	.0000000
19	.0000000	4.8888888	.9063254	-.2663137	.9446421	-16.3748410	.0000000
20	.0000000	5.4999999	.4837141	-.3517357	.5980780	-36.0230098	.0000000
21	.5000000	.0000000	1.0667746	.0000000	1.0667746	.0000000	.0000000
22	.5000000	.5692158	1.0673290	-.0091477	1.0673681	-.4910484	.0000000
23	.5000000	1.1384317	1.0689968	-.0191655	1.0691686	-1.0271143	.0000000
24	.5000000	1.7076475	1.0717943	-.0310898	1.0722451	-1.6615290	.0000000
25	.5000000	2.2768634	1.0757540	-.0463715	1.0767530	-2.4682676	.0000000
26	.5000000	2.8460792	1.0809296	-.0673610	1.0830264	-3.5659252	.0000000
27	.5000000	3.4152950	1.0873748	-.0984435	1.0918219	-5.1730664	.0000000
28	.5000000	3.9845109	1.0949692	-.1491651	1.1050827	-7.7575160	.0000000
29	.5000000	4.5537267	1.1024600	-.2445732	1.1292627	-12.5081081	.0000000
30	.5000000	5.1229426	1.1077368	-.4696878	1.2031988	-22.9772716	.0000000
31	1.0000000	.0000000	1.0814959	.0000000	1.0814959	.0000000	.0000000
32	1.0000000	.5472980	1.0824505	-.0074334	1.0824760	-.3934539	.0000000
33	1.0000000	1.0945963	1.0853820	-.0155676	1.0854936	-.8217344	.0000000
34	1.0000000	1.6418940	1.0905210	-.0252099	1.0906124	-1.3242871	.0000000
35	1.0000000	2.1891923	1.0983595	-.0374230	1.0989969	-1.9514087	.0000000
36	1.0000000	2.7364900	1.1098928	-.0537873	1.1111953	-2.7744786	.0000000
37	1.0000000	3.2837879	1.1272250	-.0769320	1.1298472	-3.9043250	.0000000
38	1.0000000	3.8310859	1.1552685	-.1117421	1.1606630	-5.5246867	.0000000
39	1.0000000	4.3783839	1.2072065	-.1684752	1.2189059	-7.9447651	.0000000
40	1.0000000	4.9256819	1.3228879	-.2712187	1.3504044	-11.5862353	.0000000
41	1.5000000	.0000000	1.0930679	.0000000	1.0930679	.0000000	.0000000
42	1.5000000	.5370722	1.0943445	-.0052192	1.0943570	-.2732558	.0000000
43	1.5000000	1.0741443	1.0982732	-.0109400	1.0983277	-.5707109	.0000000

POTENTIAL FLOW - CODE RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

OFF-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
44	1.5000000	1.6112165	1.1051853	-.0177010	1.1053270	-.9175864	.0000000
45	1.5000000	2.1482886	1.1157653	-.0261169	1.1160709	-1.3408843	.0000000
46	1.5000000	2.6853608	1.1313249	-.0369116	1.1319264	-1.8687215	.0000000
47	1.5000000	3.2224329	1.1544044	-.0508766	1.1555250	-2.5234889	.0000000
48	1.5000000	3.7595051	1.1901917	-.0684415	1.1921579	-3.2911446	.0000000
49	1.5000000	4.2965772	1.2501509	-.0874109	1.2532031	-3.9996257	.0000000
50	1.5000000	4.8336493	1.3645391	-.0916974	1.3676167	-3.5445136	.0000000
51	1.6980000	.0000003	1.0964999	.0000000	1.0964999	.0000000	.0000000
52	1.6980000	.5354972	1.0978812	-.0042163	1.0978893	-.2200387	.0000000
53	1.6980000	1.0709944	1.1021280	-.0088533	1.1021635	-.4602424	.0000000
54	1.6980000	1.6064915	1.1095825	-.0143419	1.1096752	-.7405337	.0000000
55	1.6980000	2.1419887	1.1209418	-.0211240	1.1211409	-1.0796047	.0000000
56	1.6980000	2.6774859	1.1375048	-.0296134	1.1378902	-1.4912788	.0000000
57	1.6980000	3.2129831	1.1616735	-.0400007	1.1623620	-1.9721260	.0000000
58	1.6980000	3.7484803	1.1979654	-.0514842	1.1990711	-2.4608490	.0000000
59	1.6980000	4.2839774	1.2549434	-.0592342	1.2563405	-2.7023945	.0000000
60	1.6980000	4.8194746	1.3476230	-.0398122	1.3482109	-1.6921703	.0000000
61	2.6980000	.0000000	1.1014600	.0000000	1.1014600	.0000000	.0000000
62	2.6980000	.5304882	1.1031130	.0016475	1.1031142	.0855697	.0000000
63	2.6980000	1.0609764	1.1081263	.0032144	1.1081309	.1661983	.0000000
64	2.6980000	1.5914646	1.1166773	.0047012	1.1166872	.2412119	.0000000
65	2.6980000	2.1219528	1.1291025	.0062877	1.1291200	.3190653	.0000000
66	2.6980000	2.6524410	1.1459281	.0084766	1.1459594	.4238167	.0000000
67	2.6980000	3.1829292	1.1678213	.0123254	1.1678863	.6046879	.0000000
68	2.6980000	3.7134174	1.1952677	.0197832	1.1954314	.9482328	.0000000
69	2.6980000	4.2439057	1.2275540	.0338500	1.2280206	1.5795395	.0000000
70	2.6980000	4.7743939	1.2609968	.0571151	1.2622896	2.5933624	.0000000
71	3.6980000	.0000000	1.0832642	.0000000	1.0832642	.0000000	.0000000
72	3.6980000	.5394769	1.0850501	.0081546	1.0850807	.4305925	.0000000
73	3.6980000	1.0789537	1.0903412	.0162325	1.0904620	.8529328	.0000000
74	3.6980000	1.6184306	1.0989587	.0242936	1.0992272	1.2663762	.0000000
75	3.6980000	2.1579075	1.1106556	.0326398	1.1111351	1.6833176	.0000000
76	3.6980000	2.6973844	1.1251373	.0418740	1.1259162	2.1313790	.0000000
77	3.6980000	3.2368612	1.1420099	.0528982	1.1432344	2.6520613	.0000000
78	3.6980000	3.7763381	1.1606438	.0668156	1.1625654	3.2947502	.0000000
79	3.6980000	4.3158153	1.1800432	.0846714	1.1830770	4.1040994	.0000000
80	3.6980000	4.8552918	1.1989687	.1070868	1.2037485	5.1038713	.0000000
81	11.6000000	2.6458126	1.0779491	.0378474	1.0786133	2.0108632	.0000000
82	11.6000000	2.9904785	1.0503381	.0523626	1.0516425	2.8540101	.0000000
83	11.6000000	3.3351444	1.0288601	.0558500	1.0303748	3.1071604	.0000000
84	11.6000000	3.6798103	1.0116830	.0546139	1.0131560	3.0900119	.0000000
85	11.6000000	4.0244761	.9975126	.0510617	.9988187	2.9303588	.0000000
86	11.6000000	4.3691423	.9854253	.0461960	.9865075	2.6840156	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

OFF-BODY UNIFORM AXISYMMETRIC FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
87	11.6000000	4.7138079	.9747486	.0403708	.9755843	2.3716438	.0000000
88	11.6000000	5.0584738	.9649740	.0335468	.9655569	1.9910555	.0000000
89	11.6000000	5.4031397	.9556886	.0252990	.9560234	1.5163803	.0000000
90	11.6000000	5.7478055	.9464842	.0144163	.9465940	.8726298	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOCI PSF =

OFF-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
1	-.5000000	.0000000	.0563280	.0000000	.0563286	.0000000	.0000000
2	-.5000000	.7222227	.0564155	-.0034583	.0565209	-3.5079299	.0000000
3	-.5000000	1.4444444	.0565649	-.0071937	.0571193	-7.2321088	.0000000
4	-.5000000	2.1666666	.0570402	-.0114409	.0581763	-11.3916313	.0000000
5	-.5000000	2.8888889	.0574241	-.0166579	.0597918	-16.1767013	.0000000
6	-.5000000	3.6111117	.0574459	-.0236127	.0621096	-22.3447411	.0000000
7	-.5000000	4.3333333	.0558125	-.0337315	.0652139	-31.1476214	.0000000
8	-.5000000	5.0555555	.0473481	-.0489096	.0680739	-45.9293742	.0000000
9	-.5000000	5.7777777	.0170344	-.0576301	.0600949	-73.5332689	.0000000
10	-.5000000	6.4999999	-.0027083	-.0337595	.0338679	-94.5862064	.0000000
11	.0000000	.0000003	.0609865	.0000000	.0609865	.0000000	.0000000
12	.0000000	.6111111	.0611225	-.0027456	.0611841	-2.5720113	.0000000
13	.0000000	1.2222222	.0615379	-.0056761	.0617991	-5.2699041	.0000000
14	.0000000	1.8333333	.0622570	-.0088970	.0628895	-8.1329142	.0000000
15	.0000000	2.4444444	.0633237	-.0126467	.0645742	-11.2942163	.0000000
16	.0000000	3.0555555	.0648042	-.0173047	.0670749	-14.9509091	.0000000
17	.0000000	3.6666666	.0667750	-.0235769	.0708150	-19.4470792	.0000000
18	.0000000	4.2777777	.0692123	-.0330063	.0766796	-25.4957387	.0000000
19	.0000000	4.8888888	.0712531	-.0497586	.0869076	-34.9279699	.0000000
20	.0000000	5.4999999	.0516581	-.0905523	.1095511	-55.7486119	.0000000
21	.5000000	.0000003	.0652835	.0000000	.0652835	.0000000	.0000000
22	.5000000	.5692158	.0654597	-.0022890	.0654997	-2.0026940	.0000003
23	.5000000	1.1384317	.0660022	-.0047216	.0661708	-4.0917990	.0000000
24	.5000000	1.7076475	.0669570	-.0073406	.0673582	-6.2564017	.0000000
25	.5000000	2.2768634	.0684164	-.0102948	.0691866	-8.5572321	.0000000
26	.5000000	2.8460792	.0705507	-.0137958	.0718869	-11.0642878	.0000000
27	.5000000	3.4152950	.0736838	-.0182019	.0758987	-13.8758407	.0000000
28	.5000000	3.9845109	.0784813	-.0242080	.0821300	-17.1426907	.0000000
29	.5000000	4.5537267	.0865146	-.0333760	.0927293	-21.0958283	.0000000
30	.5000000	5.1229426	.1028286	-.0494769	.1141126	-25.6949556	.0000000
31	1.0000000	.0000000	.0690438	.0000000	.0690438	.0000000	.0000000
32	1.0000000	.5472980	.0692479	-.0018573	.0692728	-1.5363455	.0000000
33	1.0000000	1.0945960	.0698756	-.0038233	.0699801	-3.1318929	.0000000
34	1.0000000	1.6418940	.0709799	-.0058913	.0712239	-4.7446248	.0000000
35	1.0000000	2.1891923	.0726650	-.0081372	.0731192	-6.3894880	.0000000
36	1.0000000	2.7364900	.0751207	-.0106453	.0758713	-8.0656165	.0000000
37	1.0000000	3.2837879	.0786977	-.0135162	.0798499	-9.7453414	.0000000
38	1.0000000	3.8310859	.0840852	-.0168575	.0857584	-11.3364567	.0000000
39	1.0000000	4.3783839	.0927631	-.0207159	.0950481	-12.5887682	.0000000
40	1.0000000	4.9256819	.1080207	-.0247624	.1108226	-12.9112910	.0000000
41	1.5000000	.0000000	.0721325	.0000000	.0721325	.0000000	.0000000
42	1.5000000	.5370722	.0723520	-.0014293	.0723661	-1.1316990	.0000000
43	1.5000000	1.0741443	.0730253	-.0029359	.0730843	-2.3022757	.0000000

POTENTIAL FLOW – EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQCI PSF =

OFF-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
44	1.5000000	1.6112165	.0742008	-.0044720	.0743355	-3.4489557	.0000000
45	1.5000000	2.1482886	.0759719	-.0060574	.0762130	-5.5586478	.0000000
46	1.5000000	2.6853608	.0784988	-.0076804	.0788737	-5.5880924	.0000000
47	1.5000000	3.2224329	.0820524	-.0092717	.0825746	-6.4469514	.0000000
48	1.5000000	3.7595051	.0870933	-.0106064	.0877367	-6.9433887	.0000000
49	1.5000000	4.2965772	.0944205	-.0110188	.0950613	-6.6562846	.0000000
50	1.5000000	4.8336493	.1056748	-.0084258	.1060101	-4.5587593	.0000000
51	1.6980000	.0000000	.0731504	.0000000	.0731504	.0000000	.0000000
52	1.6980000	.5354972	.0733728	-.0012611	.0733837	-.9847085	.0000000
53	1.6980000	1.0709944	.0740543	-.0025878	.0740995	-2.0013385	.0000000
54	1.6980000	1.6064915	.0752394	-.0039204	.0753415	-2.9827717	.0000000
55	1.6980000	2.1419887	.0770122	-.0052595	.0771915	-3.9069466	.0000000
56	1.6980000	2.6774859	.0795138	-.0065658	.0797844	-4.7204307	.0000000
57	1.6980000	3.2129831	.0829690	-.0077268	.0833280	-5.3205673	.0000000
58	1.6980000	3.7484803	.0877243	-.0084535	.0861306	-5.5042924	.0000000
59	1.6980000	4.2839774	.0942649	-.0079966	.0946034	-4.8488337	.0000000
60	1.6980000	4.8194746	.1030136	-.0040918	.1030949	-2.2746374	.0000000
61	2.6980000	.0000000	.0764384	.0000000	.0764384	.0000000	.0000000
62	2.6980000	.5304882	.0766468	-.0004275	.0766480	-.3195335	.0000000
63	2.6980000	1.0609764	.0772764	-.0008858	.0772815	-.6567349	.0000000
64	2.6980000	1.5914646	.0783400	-.0012738	.0783503	-.9315481	.0000000
65	2.6980000	2.1219528	.0798580	-.0015461	.0798730	-1.1091627	.0000000
66	2.6980000	2.6524410	.0818542	-.0016137	.0818701	-1.1293749	.0000000
67	2.6980000	3.1829292	.0843375	-.0013341	.0843480	-.9067612	.0000000
68	2.6980000	3.7134174	.0872573	-.0004941	.0872587	-.3244609	.0000000
69	2.6980000	4.2439057	.0904048	.0011678	.0904123	.7400960	.0000000
70	2.6980000	4.7743939	.0932856	.0037818	.0933622	2.3215089	.0000000
71	3.6980000	.0000000	.0767916	.0000000	.0767916	.0000000	.0000000
72	3.6980000	.5394769	.0769769	.0003058	.0769776	.2275869	.0000000
73	3.6980000	1.0789537	.0775254	.0005762	.0775276	.4258738	.0000000
74	3.6980000	1.6184306	.0784161	.0009115	.0784214	.6659335	.0000000
75	3.6980000	2.1579075	.0796152	.0013500	.0796267	.9714813	.0000000
76	3.6980000	2.6973844	.0810753	.0019612	.0810990	1.3857213	.0000000
77	3.6980000	3.2368612	.0827264	.002830[illegible]	.0827748	1.9597430	.0000000
78	3.6980000	3.7763381	.0844663	.0040456	.0845632	2.7421764	.0000000
79	3.6980000	4.3158150	.0861559	.0056614	.0863417	3.7595763	.0000000
80	3.6980000	4.8552918	.0876471	.0076667	.0879818	4.9990599	.0000000
81	11.6000000	2.6458126	.0764527	-.0010900	.0764605	-.8168081	.0000000
82	11.6000000	2.9904785	.0751585	.0022892	.0751933	1.7446085	.0000000
83	11.6000000	3.3351444	.0738162	.0031368	.0738828	2.4333389	.0000000
84	11.6000000	3.6798103	.0726630	.0033236	.0727390	2.6189024	.0000000
85	11.6000000	4.0244761	.0716851	.0032238	.0717576	2.5749686	.0000000
86	11.6000000	4.3691420	.0708441	.0029749	.0709066	2.4045547	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 Z-BODY CASE NO. BFOCI PSF =

OFF-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
87	11.6000000	4.7138079	.0700939	.0026251	.0701431	2.1448225	.0000000
88	11.6000000	5.0584738	.0694036	.0021738	.0694376	1.7940177	.0000000
89	11.6000000	5.4031397	.0687543	.0015820	.0687725	1.3181224	.0000000
90	11.6000000	5.7478055	.0681509	.0006926	.0681544	.5822360	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 Z-BODY CASE NO. BFQC1 PSF =

OFF-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
1	-.5000000	.0000000	-15.9397776	.0000000	15.9397776	180.0000019	.0000000
2	-.5000000	.7222222	-15.9661947	1.0417019	16.0001411	176.2670746	.0000000
3	-.5000000	1.4444444	-16.0430660	2.1530280	16.1868927	172.3564053	.0000003
4	-.5000000	2.1666666	-16.1601150	3.4214583	16.5183442	168.0457363	.0000000
5	-.5000000	2.8888889	-16.2849598	4.9794677	17.0292399	162.9978905	.0000000
6	-.5000000	3.6111111	-16.3129623	7.0586314	17.7746170	156.6018276	.0000000
7	-.5000000	4.3333333	-15.8715270	10.0948677	18.8098836	147.5421581	.0000000
8	-.5000000	5.0555555	-13.4349142	14.7078792	19.9203069	132.4101410	.0000000
9	-.5000000	5.7777777	-4.3383911	17.6056845	18.1323402	103.8430233	.0000000
10	-.5000000	6.4999999	1.9258882	10.4536349	10.6295586	79.5613661	.0000000
11	.0000000	.0000000	-17.3314838	.0000000	17.3314838	180.0000019	.0000000
12	.0000000	.6111111	-17.3724091	.8296130	17.3922067	177.2659397	.0000000
13	.0000000	1.2222222	-17.4976194	1.6996953	17.5799785	174.4517727	.0000000
14	.0000000	1.8333333	-17.7148249	2.6588781	17.9132535	171.4640026	.0000000
15	.0000000	2.4444444	-18.0382125	3.7755076	18.4290955	168.1783066	.0000000
16	.0000000	3.0555555	-18.4899008	5.1610594	19.1966915	164.4040642	.0000000
17	.0000000	3.6666666	-19.0980160	7.0246652	20.3489590	159.8053818	.0000000
18	.0000000	4.2777777	-19.8702292	9.8242776	22.1662455	153.6911983	.0000000
19	.0000000	4.8888888	-20.5989864	14.8065265	25.3663162	144.2914658	.0000000
20	.0000000	5.4999999	-18.1776121	27.1171918	32.6460972	123.8353453	.0000000
21	.5000000	.0000000	-18.6145983	.0000000	18.6145983	180.0000019	.0000000
22	.5000000	.5692158	-18.6672852	.6935838	18.6801658	177.8721523	.0000000
23	.5000000	1.1364317	-18.8296013	1.4141063	18.8826263	175.7051411	.0000000
24	.5000000	1.7076475	-19.1155045	2.1928092	19.2408659	173.4559994	.0000000
25	.5000000	2.2768634	-19.5529211	3.0706532	19.7925649	171.0749836	.0000000
26	.5000000	2.8460792	-20.1936214	4.1088494	20.6074011	168.4988823	.0000000
27	.5000000	3.4152950	-21.1359713	5.4110025	21.8176129	165.6401711	.0000000
28	.5000000	3.9845109	-22.5824165	7.1775004	23.6956122	162.3678818	.0000000
29	.5000000	4.5537267	-25.0122857	9.8538897	26.8833325	158.4974461	.0000000
30	.5000000	5.1229426	-29.9618511	14.4866191	33.2802439	154.1961346	.0000000
31	1.0000000	.0000000	-19.7372224	.0000000	19.7372224	180.0000019	.0000000
32	1.0000000	.5472980	-19.7979388	.5652604	19.8060067	178.3645668	.0000000
33	1.0000000	1.0945960	-19.9848974	1.1463422	20.0177476	176.7170868	.0000000
34	1.0000000	1.6418940	-20.3138201	1.7604242	20.3899577	175.0470428	.0000000
35	1.0000000	2.1891920	-20.8158100	2.4269279	20.9568107	173.3498764	.0000000
36	1.0000000	2.7364900	-21.5474291	3.1689759	21.7792127	171.6335011	.0000000
37	1.0000000	3.2837879	-22.6128609	4.0139026	22.9663424	169.9345379	.0000000
38	1.0000000	3.8310859	-24.2158706	4.9890176	24.7244551	168.3586559	.0000000
39	1.0000000	4.3783839	-26.7909815	6.0965231	27.4759076	167.1799469	.0000000
40	1.0000000	4.9256819	-31.2911239	7.2082872	32.1106496	167.0275364	.0000000
41	1.5000000	.0000000	-20.6598568	.0000000	20.6598568	180.0000019	.0000000
42	1.5000000	.5370722	-20.7249629	.4380825	20.7295923	178.7890682	.0000000
43	1.5000000	1.0741443	-20.9247360	.8824707	20.9433360	177.5850639	.0000003

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

OFF-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
44	1.5000000	1.6112165	-21.2735207	1.3386143	21.3155944	176.3994694	.0000000
45	1.5000000	2.1482986	-21.7988141	1.8098984	21.8737378	175.2563801	.0000000
46	1.5000000	2.6853608	-22.5478852	2.2896245	22.6637359	174.2042923	.0000000
47	1.5000000	3.2224329	-23.6031308	2.7554439	23.7604427	173.3405571	.0000000
48	1.5000000	3.7595051	-25.0895865	3.1406216	25.2853882	172.8650379	.0000000
49	1.5000000	4.2965772	-27.2461581	3.2467248	27.4366837	173.2086735	.0000000
50	1.5000000	4.8336493	-30.5331926	2.4520118	30.6320355	175.3959560	.0000000
51	1.6980000	.0000000	-20.9642792	.0000000	20.9642792	180.0000019	.0000000
52	1.6980000	.5354972	-21.0302198	.3881726	21.0338018	178.9425640	.0000000
53	1.6980000	1.0709944	-21.2321658	.7793831	21.2464657	177.8977509	.0000000
54	1.6980000	1.6064915	-21.5832729	1.1751635	21.6152418	176.8834438	.0000000
55	1.6980000	2.1419887	-22.1083345	1.5725034	22.1641879	175.9315662	.0000000
56	1.6980000	2.6774859	-22.8486583	1.9586615	22.9324558	175.1003971	.0000000
57	1.6980000	3.2129831	-23.8698945	2.2989438	23.9803462	174.4987297	.0000000
58	1.6980000	3.7484803	-25.2722116	2.5063293	25.3961878	174.3363075	.0000000
59	1.6980000	4.2839774	-27.1935530	2.3587983	27.2956636	175.3425110	.0000000
60	1.6980000	4.8194746	-29.7508678	1.1962757	29.7749090	177.6973915	.0000000
61	2.6980000	.0000000	-21.9534793	.0000000	21.9534793	180.0000019	.0000000
62	2.6980000	.5304882	-22.0149283	.1418401	22.0153852	179.6308556	.0000000
63	2.6980000	1.0609764	-22.2004950	.2762915	22.2022142	179.2869759	.0000000
64	2.6980000	1.5914646	-22.5138636	.3932535	22.5172977	178.9993076	.0000000
65	2.6980000	2.1219529	-22.9608846	.4762702	22.9658234	178.8117027	.0000000
66	2.6980000	2.6524410	-23.5480556	.4985130	23.5533316	178.7872295	.0000000
67	2.6980000	3.1829292	-24.2773681	.4175536	24.2809584	179.0146503	.0000000
68	2.6980000	3.7134174	-25.1328752	.1708744	25.1334560	179.6104622	.0000000
69	2.6980000	4.2439057	-26.0516722	-.3175174	26.0536070	-179.3017159	.0000000
70	2.6980000	4.7743939	-26.8879397	-1.0938705	26.9097764	-177.6916199	.0000000
71	3.6980000	.0000000	-22.0774684	.0000000	22.0774684	180.0000019	.0000000
72	3.6980000	.5394769	-22.1318064	-.0736205	22.1319287	-179.8094101	.0000000
73	3.6980000	1.0789537	-22.2926903	-.1535164	22.2932189	-179.6054440	.0000000
74	3.6980000	1.6184306	-22.5539379	-.2488500	22.5553107	-179.3678513	.0000000
75	3.6980000	2.1579075	-22.9056206	-.3741975	22.9086769	-179.0640717	.0000000
76	3.6980000	2.6973844	-23.3334734	-.5501703	23.3399584	-178.6492977	.0000000
77	3.6980000	3.2368612	-23.8167233	-.8020090	23.8302228	-178.0713406	.0000000
78	3.6980000	3.7763381	-24.3248320	-1.1548215	24.3522291	-177.2819233	.0000000
79	3.6980000	4.3158150	-24.8165889	-1.6243846	24.8696945	-176.2550125	.0000000
80	3.6980000	4.8552918	-25.2483821	-2.2066857	25.3446298	-175.0050945	.0000000
81	11.6000000	2.6458126	-22.4884136	-.7891934	22.5022571	-177.9901257	.0000000
82	11.6000000	2.9904785	-21.9125426	-1.0915834	21.9397144	-177.1481419	.0000000
83	11.6000000	3.3351444	-21.4646664	-1.1640083	21.4962046	-176.8959465	.0000000
84	11.6000000	3.6798103	-21.1065302	-1.1379564	21.1371841	-176.9138927	.0000000
85	11.6000000	4.0244761	-20.8111172	-1.0636110	20.8382788	-177.0742836	.0000000
86	11.6000000	4.3691420	-20.5591562	-.9618282	20.5816426	-177.3214607	.0000000

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

OFF-BODY STRIP VORTEX FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VT	THETA	PHI
87	11.6000000	4.7138079	-20.3366148	-.8399565	20.3539536	-177.6348782	.0000000
88	11.6000000	5.0584738	-20.1328881	-.6969786	20.1449487	-178.0172749	.0000000
89	11.6000000	5.4031397	-19.9396064	-.5236151	19.9464803	-178.4957561	.0000000
90	11.6000000	5.7478055	-19.7491326	-.2925843	19.7512996	-179.1512241	.0000000

POTENTIAL FLOW - FOOF RELEASE 2 DATE 053177

THE FOLLOWING NUMBERS ARE THE CARD IMAGES THAT GET PUNCHED WHEN THERE IS PUNCHED OUTPUT

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-.50000000+00-.50000000+00-.50000000+00-.50000000+00
-.50000000+00-.50000000+00-.50000000+00-.50000000+00
-.50000000+00-.50000000+00 .00000000    .00000000
 .00000000    .00000000    .00000000    .00000000
 .00000000    .00000000    .00000000    .00000000
 .50000000+00 .50000000+00 .50000000+00 .50000000+00
 .50000000+00 .50000000+00 .50000000+00 .50000000+00
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.86514603-01	.10282864+00	.69043849-01	.69247864-01
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-.16284960+02	-.16312962+02	-.15871527+02	-.13434914+02
-.43383911+01	.19258882+01	-.17331484+02	-.17372409+02
-.17497619+02	-.17714825+02	-.18038213+02	-.18489901+02
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.40139026+01	.49890176+01	.60966231+01	.72082872+01
.00000000	.43838253+00	.88247071+00	.13386143+01
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.32447248+01	.24588118+01	.00000000	.38817257+00
.77938306+00	.11751635+01	.15725034+01	.19586615+01
.22989438+01	.25063293+01	.23587983+01	.11962757+01
.00000000	.14184007+00	.27629148+00	.39325351+00
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-.15351643+00	-.24885005+00	-.37419750+00	-.55017027+00
-.80203896+00	-.11548215+01	-.16243846+01	-.22066857+01
-.78919335+00	-.10915834+01	-.11640083+01	-.11379564+01
-.10636110+01	-.96182823+00	-.83995651+00	-.69697861+00
-.52361510+00	-.29258426+00		

POTENTIAL FLOW - EOOF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.3 2-BODY CASE NO. BFOCI PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
1	8.0110000	.0000000							
	8.0152385	.1151024	.1140952	.1157871	.99742	.07174	.0009309	.0000000	-.1017751
2	8.0275149	.2296225							
	8.0482578	.3442699	.1088069	.1144066	.97723	.21217	.0027213	-.0000001	-.3048832
3	8.0769252	.4571968							
	8.1128740	.5668563	.0985504	.1120928	.93964	.34216	.0042526	-.0000000	-.5033157
4	8.1558563	.6739545							
	8.2057551	.7786680	.0852680	.1090259	.88942	.45709	.0054206	.0000002	-.6937730
5	8.2618482	.8801982							
	8.3240924	.9789353	.0708848	.1053331	.83099	.55629	.0062298	.0000005	-.8756208
6	8.3916585	1.0741090							
	8.4645996	1.1662226	.0567095	.1012605	.76826	.64013	.0067116	.0000001	-1.0481308
7	8.5420380	1.2545890							
	8.6241082	1.3397385	.0436620	.0969623	.70414	.71006	.0069300	-.0000002	-1.2098348
8	8.7099422	1.4210927							
	8.7967980	1.4967089	.0323666	.0927147	.64148	.76714	.0069537	.0000004	-1.3579420
9	8.8865939	1.5682088							
	8.9802898	1.6383442	.0228493	.0885948	.58112	.81382	.0068498	.0000004	-1.4931654
10	9.0764732	1.7043962							
	9.1759719	1.7676933	.0148264	.0846039	.52235	.85273	.0066631	.0000004	-1.6181396
11	9.2775625	1.8275751							
	9.3819519	1.8846013	.0081655	.0807948	.46548	.88506	.0064289	.0000004	-1.7323351
12	9.4880913	1.9382993							
	9.5965809	1.9890973	.0026667	.0771800	.41060	.91182	.0061712	.0000006	-1.8355789
13	9.7065265	2.0366619							
	9.8184350	2.0813177	-.0018873	.0738036	.35762	.93387	.0059065	-.0000001	-1.9277090
14	9.9315463	2.1228321							
	10.0462868	2.1614498	-.0056866	.0706314	.30639	.95191	.0056429	-.0000005	-2.0087836
15	10.1620110	2.1970111							
	10.2790741	2.2296982	-.0088942	.0676801	.25669	.96649	.0053830	.0000002	-2.0787919
16	10.3969290	2.2594033							
	10.5158712	2.2862603	-.0116095	.0649014	.20830	.97807	.0051290	-.0000002	-2.1378784
17	10.6354350	2.3101971							
	10.7558620	2.3313097	-.0139003	.0623093	.16095	.98696	.0048788	-.0000006	-2.1860478
18	10.8767570	2.3495523							
	10.9983147	2.3649888	-.0157652	.0598836	.11442	.99343	.0046327	-.0000002	-2.2233647
19	11.1201990	2.3775911							
	11.2425621	2.3873996	-.0171307	.0576231	.06845	.99765	.0043948	.0000007	-2.2498303
20	11.3651180	2.3943955							
	11.4880365	2.3981811	-.0179366	.0555637	.02279	.99974	.0042005	.0000005	-2.2649292
21	11.6109999	2.4000000							
	11.7385459	2.4000003	-.0180606	.0536363	.00000	1.00000	.0041096	-.0000003	-2.2712730
22	11.8660920	2.4000000							
	12.0191474	2.4000000	-.0178361	.0515409	.00000	1.00000	.0039881	.0000021	-2.2763019

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
23	12.1722029	2.4000000							
	12.3558694	2.4000000	-.0174912	.0490578	.00000	1.00000	.0037967	-.0000012	-2.2822613
24	12.5395360	2.4000000							
	12.7599355	2.4000000	-.0167487	.0461714	.00000	1.00000	.0035524	.0000001	-2.2891886
25	12.9803350	2.4000000							
	13.2448145	2.4000000	-.0154594	.0429099	.00000	1.00000	.0032691	-.0000002	-2.2970163
26	13.5092940	2.4000000							
	13.8266695	2.4000000	-.0135062	.0393924	.00000	1.00000	.0029649	-.0000002	-2.3054583
27	14.1440450	2.4000000							
	14.5248954	2.4000000	-.0108174	.0356487	.00000	1.00000	.0026649	-.0000006	-2.3139632
28	14.9057460	2.4000000							
	15.3627670	2.4000000	-.0073880	.0326669	.00000	1.00000	.0024037	-.0000006	-2.3215995
29	15.8197880	2.4000000							
	16.3242929	2.4000000	-.0034143	.0305061	.00000	1.00000	.0022297	-.0000010	-2.3267853
30	16.8287981	2.4000000							
	17.3333035	2.4000000	.0007648	.0299483	.00000	1.00000	.0021812	.0000003	-2.3281240
31	17.8378091	2.4000000							
	18.3423140	2.4000000	.0050832	.0311693	.00000	1.00000	.0022667	.0000000	-2.3251938
32	18.8468189	2.4000000							
	19.3513243	2.4000000	.0097445	.0342689	.00000	1.00000	.0024907	-.0000005	-2.3177547
33	19.8558300	2.4000000							
	20.3603354	2.4000000	.0150111	.0394451	.00000	1.00000	.0028665	-.0000002	-2.3053316
34	20.8648410	2.4000000							
	21.3693459	2.4000000	.0211954	.0470140	.00000	1.00000	.0034164	-.0000004	-2.2871665
35	21.8738511	2.4000000							
	22.3783565	2.4000000	.0286663	.0574398	.00000	1.00000	.0041741	-.0000020	-2.2621444
36	22.8828621	2.4000000							
	23.3873670	2.4000000	.0378778	.0713528	.00000	1.00000	.0051855	-.0000017	-2.2287532
37	23.8918719	2.4000000							
	24.3963773	2.4000000	.0493851	.0895970	.00000	1.00000	.0065119	-.0000014	-2.1849671
38	24.9008830	2.4000000							
	25.4053879	2.4000000	.0638757	.1132774	.00000	1.00000	.0082346	-.0000011	-2.1281342
39	25.9098930	2.4000000							
	26.4143984	2.4000000	.0822027	.1438206	.00000	1.00000	.0104586	-.0000008	-2.0548306
40	26.9189041	2.4000000							
	27.4234090	2.4000000	.1054062	.1830505	.00000	1.00000	.0133213	-.0000012	-1.9606789
41	27.9279139	2.4000000							
	28.4324193	2.4000000	.1347067	.2332659	.00000	1.00000	.0170005	-.0000017	-1.8401618
42	28.9369249	2.4000000							
	29.4414299	2.4000000	.1713968	.2973033	.00000	1.00000	.0217313	-.0000013	-1.6864720
43	29.9459350	2.4000000							
	30.4504404	2.4000000	.2164361	.3784906	.00000	1.00000	.0278280	-.0000016	-1.4916220
44	30.9549460	2.4000000							
	31.4594514	2.4000000	.2693010	.4803131	.00000	1.00000	.0357203	-.0000021	-1.2472486

POTENTIAL FLOW - FODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. 9FOC1 PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
45	31.9639571	2.4000000							
	32.4684620	2.4000000	.3249609	.6052461	.00000	1.00000	.0460914	-.0000011	-.9474094
46	32.9729671	2.4000000							
	33.4774718	2.4000000	.3666666	.7515670	.00000	1.00000	.0594442	-.0000008	-.5962392
47	33.9819770	2.4000000							
	34.4864821	2.4000000	.3501757	.9055276	.00000	1.00000	.0768696	-.0000004	-.2267338
48	34.9909878	2.4000000							
	35.4954939	2.4000000	.1286936	1.0195507	.00000	1.00000	.0994204	-.0000009	.0469216
49	36.0000000	2.4000000							
50	36.0000000	6.0000000							
	35.4954939	6.0000000	-1.4737899	.6619967	.00000	-1.00000	-.9040679	.0000001	-1.9080197
51	34.9909878	6.0000000							
	34.4864821	6.0000000	-.8956349	.4916277	.00000	-1.00000	-1.2708815	-.0000007	-3.0502338
52	33.9819770	6.0000000							
	33.4774718	6.0000000	-.6019819	.3707557	.00000	-1.00000	-1.5014176	.0000005	-3.7754660
53	32.9729671	6.0000000							
	32.4684620	6.0000000	-.4391908	.2851543	.00000	-1.00000	-1.6638459	.0000006	-4.2890745
54	31.9639571	6.0000000							
	31.4594514	6.0000000	-.3321297	.2212719	.00000	-1.00000	-1.7850879	-.0000001	-4.6723685
55	30.9549460	6.0000000							
	30.4504404	6.0000000	-.2553711	.1724547	.00000	-1.00000	-1.8782487	-.0000005	-4.9652718
56	29.9459350	6.0000000							
	29.4414299	6.0000000	-.1978966	.1347312	.00000	-1.00000	-1.9509993	-.0000000	-5.1916127
57	28.9369249	6.0000000							
	28.4324193	6.0000000	-.1538853	.1054304	.00000	-1.00000	-2.0083576	-.0000004	-5.3674178
58	27.9279139	6.0000000							
	27.4234090	6.0000000	-.1197779	.0825253	.00000	-1.00000	-2.0538340	.0000001	-5.5042485
59	26.9189041	6.0000000							
	26.4143984	6.0000000	-.0931686	.0648758	.00000	-1.00000	-2.0899865	-.0000013	-5.6107455
60	25.9098930	6.0000000							
	25.4053879	6.0000000	-.0723020	.0510812	.00000	-1.00000	-2.1187263	-.0000012	-5.6935128
61	24.9008830	6.0000000							
	24.3963773	6.0000000	-.0558645	.0403963	.00000	-1.00000	-2.1414976	-.0000021	-5.7576220
62	23.8918719	6.0000000							
	23.3873670	6.0000000	-.0428299	.0321686	.00000	-1.00000	-2.1594019	-.0000008	-5.8069883
63	22.8828621	6.0000000							
	22.3783565	6.0000000	-.0324086	.0258943	.00000	-1.00000	-2.1732759	-.0000004	-5.8446343
64	21.8738511	6.0000000							
	21.3693459	6.0000000	-.0239545	.0211936	.00000	-1.00000	-2.1837513	-.0000007	-5.8728384
65	20.8648410	6.0000000							
	20.3603354	6.0000000	-.0169579	.0177824	.00000	-1.00000	-2.1912957	-.0000012	-5.8933053
66	19.8558300	6.0000000							

19.3513243	6.0000003	-.0139883	.3154517	.00000	-1.00003	-2.1962432	-.0000007	-5.9072900

POTENTIAL FLOW - FDDF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.3 2-BODY CASE NO. BFOC1 PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
67	18.8468189	6.0000000							
	18.3423140	6.0000000	-.0056721	.0140622	.00000	-1.00000	-2.1988124	-.0000032	-5.9156265
68	17.8378091	6.0000000							
	17.3333035	6.0000000	-.0006856	.0135305	.00000	-1.00000	-2.1991208	-.0000026	-5.9188172
69	16.8287981	6.0000003							
	16.3242929	6.0000000	.0043232	.0138311	.00000	-1.00003	-2.1971897	-.0000025	-5.9170132
70	15.8197880	6.0000003							
	15.3627670	6.0000000	.0094691	.0149233	.00000	-1.00003	-2.1931916	-.0000025	-5.9104603
71	14.9057460	6.0000000							
	14.5248954	6.0000003	.0146339	.0165932	.00000	-1.00000	-2.1878562	-.0000019	-5.9004589
72	14.1440450	6.0000000							
	13.8266695	6.0000003	.0198777	.0185825	.00000	-1.00000	-2.1819423	-.0000013	-5.8885063
73	13.5092940	6.0000000							
	13.2448145	6.0000000	.0254584	.0207644	.00000	-1.00000	-2.1758504	-.0000007	-5.8754135
74	12.9803350	6.0000003							
	12.7599355	6.0000000	.0317074	.0230585	.00000	-1.00000	-2.1698346	-.000[illegible]12	-5.8616488
75	12.5395360	6.0000003							
	12.3558694	6.0000000	.0391239	.0254299	.00000	-1.00003	-2.1640826	-.0000009	-5.8474205
76	12.1722029	6.0000000							
	12.0191474	6.0000003	.0480356	.0278896	.00000	-1.00000	-2.1589854	-.0000003	-5.8326685
77	11.8660920	6.0000000							
	11.7385459	6.0000003	.0795332	.0306512	.00000	-1.00000	-2.1566217	-.0000022	-5.8160926
78	11.6109999	6.0000000							
	11.4849260	5.9993708	.0746253	.0342063	-.00763	-.99997	-2.1527596	-.0000015	-5.7941543
79	11.3588570	5.9980749							
	11.2336416	5.9957247	.0401443	.0367103	-.02232	-.99975	-2.1333258	-.0000017	-5.7756200
80	11.1084460	5.9924832							
	10.9840175	5.9884013	.0295126	.0381591	-.03613	-.99935	-2.0964085	-.0000026	-5.7598892
81	10.8596190	5.9834879							
	10.7359110	5.9777982	.0212648	.0391790	-.04906	-.99880	-2.0469943	-.0000016	-5.7435951
82	10.6122410	5.9713367							
	10.4891906	5.9641594	.0159693	.0399236	-.06114	-.99813	-1.9878287	-.0000018	-5.7260485
83	10.36[illegible]840	5.9562637							
	10.2[illegible]339	5.9477100	.0126279	.0405073	-.07239	-.99738	-1.9215511	-.00[illegible]27	-5.7067846
84	10.1233320	5.9384915							
	9.9994266	5.9286683	.0107955	.0409950	-.08283	-.99656	-1.8505643	-.0000025	-5.6856227
85	9.8775721	5.9182321							
	9.7561605	5.9072418	.0101707	.0414489	-.09246	-.99572	-1.7769654	-.0000029	-5.6623929
86	9.6348013	5.8956888							
	9.5138347	5.8836297	.0105756	.0419112	-.10131	-.99485	-1.7024917	-.0000028	-5.6370400
87	9.3929205	5.8710566							
	9.2723523	5.8580235	.0118738	.0424335	-.10940	-.99400	-1.6285269	-.0000013	-5.6094470
88	9.1518356	5.8445236							
	9.0316215	5.8306080	.0139817	.0430542	-.11673	-.99316	-1.5561182	-.0000017	-5.5795758

POTENTIAL FLOW - FOOF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
89	8.9114568	5.8162720							
	8.7915541	5.8015628	.0168250	.0438024	-.12332	-.99237	-1.4860305	-.0000014	-5.5474406
90	8.6716980	5.7864783							
	8.5520655	5.7710621	.0204027	.0447135	-.12918	-.99162	-1.4187810	-.0000015	-5.5130176
91	8.4324759	5.7553149							
	8.3130736	5.7392761	.0246624	.0458135	-.13432	-.99094	-1.3546928	-.0000021	-5.4763396
92	8.1937102	5.7229496							
	8.0744991	5.7063711	.0296279	.0471460	-.13876	-.99033	-1.2939359	-.0000020	-5.4373384
93	7.9553225	5.6895475							
	7.8362648	5.6725104	.0353214	.0487347	-.14250	-.98979	-1.2365653	-.0000020	-5.3960625
94	7.7172364	5.6552734							
	7.5982949	5.6378548	.0417633	.0506183	-.14555	-.98935	-1.1825506	-.0000013	-5.3524764
95	7.4793769	5.6202781							
	7.3605146	5.6025631	.0489981	.0528389	-.14791	-.98900	-1.1318024	-.0000016	-5.3065299
96	7.2416701	5.5847288							
	7.1228507	5.5667928	.0571015	.0554320	-.14958	-.98875	-1.0841899	-.0000011	-5.2582145
97	7.0040429	5.5487792							
	6.8852304	5.5306991	.0661051	.0584432	-.15053	-.98860	-1.0395481	-.0000013	-5.2074671
98	6.7664229	5.5125853							
	6.6475802	5.4944441	.0761582	.0619291	-.15090	-.98855	-.9977138	-.0000003	-5.1541784
99	5.5287375	5.4763033							
	6.4099004	5.4581881	.087[illegible]053	.0659338	-.15054	-.98860	-.9585104	-.0000002	-5.0983088
100	6.2910579	5.4401098							
	6.1722546	5.4221053	.0996214	.0705093	-.14950	-.98876	-.9217732	-.0000001	-5.0397966
101	6.0534394	5.4041809							
	5.9346336	5.3863657	.1132867	.0757351	-.14779	-.98902	-.8873269	-.0000000	-4.9784287
102	5.8158097	5.3686723							
	5.6969648	5.3511245	.1284343	.0816735	-.14539	-.98937	-.8549844	.0000001	-4.9140794
103	5.5780960	5.3337401							
	5.4591755	5.3165385	.1452402	.0884048	-.14231	-.98982	-.8245690	.0000005	-4.8465307
104	5.3402255	5.2995417							
	5.2211922	5.2827654	.1638902	.0960281	-.13853	-.99036	-.7959083	.0000005	-4.7754716
105	5.1021244	5.2662359							
	4.9829406	5.2499650	.1845993	.1046375	-.13406	-.99097	-.7688401	.0000009	-4.7006218
106	4.8637178	5.2339833							
	4.7443452	5.2182993	.2076370	.1143471	-.12889	-.99166	-.7432088	-.0000000	-4.6216019
107	4.6249295	5.2029475							
	4.5053288	5.1879333	.2332813	.1252869	-.12300	-.99241	-.7188636	.0000003	-4.5379530
108	4.3856617	5.1732945							
	4.2658126	5.1590343	.2618887	.1376003	-.11639	-.99320	-.6956623	.0000003	-4.4491496
109	4.1458942	5.1451945							
	4.0257148	5.1317750	.2938510	.1514462	-.10905	-.99404	-.6734690	.0000001	-4.3545872
110	3.9054843	5.1188215							
	3.7849513	5.1063317	.3296501	.1670139	-.10095	-.99489	-.6521543	.0000003	-4.2535031

POTENTIAL FLOW - EGOF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.3 2-BODY CASE NO. RFDC1 PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
111	3.6643663	5.0943546							
	3.5434346	5.0828863	.3696583	.1845074	-.09210	-.99575	-.6315992	-.0000007	-4.1450563
112	3.4224512	5.0719786							
	3.3010736	5.0616266	.4151837	.2041695	-.08248	-.99659	-.6116913	.0000000	-4.0281968
113	3.1796457	5.0518844							
	3.0577727	5.0427473	.4665316	.2262841	-.07206	-.99740	-.5923225	.0000002	-3.9016539
114	2.9358520	5.0342705							
	2.8134310	5.0264507	.5250779	.2511750	-.06084	-.99815	-.5733682	.0000002	-3.7639318
115	2.6909667	5.0193437							
	2.5679423	5.0129486	.5924533	.2792460	-.04880	-.99881	-.5546447	-.0000001	-3.6131025
116	2.4448805	5.0073702							
	2.3211935	5.0024620	.6739850	.3109871	-.03592	-.99935	-.5358060	-.0000005	-3.4467607
117	2.1974770	4.9984267							
	2.0730640	4.9952242	.7658052	.3470451	-.02219	-.99975	-.5161494	.0000001	-3.2616563
118	1.9486315	4.9929024							
	1.8233214	4.9912016	.8816608	.3882354	-.00759	-.99997	-.4929606	.0000001	-3.0534405
119	1.6980000	4.9910003							
	1.6122447	4.9923773	1.0249070	.4282709	.02530	-.99968	-.4660549	.0000002	-2.8542874
120	1.5265295	4.9953403							
	1.4451099	5.0004653	1.1700337	.4641756	.07516	-.99717	-.4452452	.0000003	-2.6793715
121	1.3638420	5.0076025							
	1.2867347	5.0162761	1.2980373	.5016849	.12396	-.99229	-.4294235	.0000002	-2.4996859
122	1.2098634	5.0268365							
	1.1370124	5.0386738	1.4302784	.5402189	.17254	-.98500	-.4154849	.0000004	-2.3166854
123	1.0644770	5.0523051							
	.9958170	5.0669929	1.5683420	.5795383	.22163	-.97513	-.4024929	-.0000009	-2.1304765
124	.9275536	5.0834258							
	.8630218	5.1007380	1.7147315	.6194818	.27196	-.96231	-.3898260	.0000002	-1.9409239
125	.7989744	5.1197639							
	.7385202	5.1395319	1.8717134	.6599396	.32423	-.94598	-.3770077	.0000002	-1.7477513
126	.6786504	5.1610051							
	.6222402	5.1831179	2.0417148	.7008558	.37921	-.92531	-.3635982	.0000003	-1.5504997
127	.5665420	5.2069486							
	.5141859	5.2313510	2.2276461	.7422115	.43766	-.89914	-.3491249	.0000002	-1.3485820
128	.4626816	5.2575035							
	.4154019	5.2836321	2.4291258	.7836078	.49976	-.86617	-.3330522	.0000007	-1.1433369
129	.3691185	5.3114873							
	.3262277	5.3396325	2.6479151	.8248927	.56589	-.82448	-.3150018	.0000004	-.9350088
130	.2845438	5.3695360							
	.2462618	5.3996398	2.8861560	.8663548	.63658	-.77121	-.2940277	.0000001	-.7216359
131	.2090980	5.4315221							
	.1760083	5.4634863	3.1421092	.9079318	.71141	-.70277	-.2691003	-.0000001	-.5030138
132	.1445518	5.4972162							
	.1176815	5.5294433	3.3997217	.9456308	.78674	-.61728	-.2397985	.0000001	-.2840430

POTENTIAL FLOW - FODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
133	.0927733	5.5632098							
	.0710843	5.5969337	3.6498350	.9883181	.85888	-.51218	-.2062538	.0000001	-.0653830
134	.0517239	5.6320462							
	.0356628	5.6669440	3.8801607	1.0278149	.92349	-.38363	-.1677184	-.0000001	.1576255
135	.0222693	5.7029500							
	.0122057	5.7384667	4.0779324	1.0669064	.97232	-.23365	-.1264691	-.0000001	.3839402
136	.0050333	5.7746781							
	.0010348	5.8072249	4.3086671	1.1041358	.99704	-.07683	-.0879574	-.0000001	.6047403
137	.0000000	5.8400000							
	.0027027	5.8743638	4.5953121	1.1423435	.98884	.14901	-.0157325	.0000002	.8361775
138	.0102465	5.9079982							
	.0232597	5.9373530	4.4573578	1.1820509	.88255	.47022	.1195481	.0000002	1.0809003
139	.0403651	5.9645276							
	.0596903	5.9879149	3.9178016	1.2160127	.73832	.67445	.2107172	.0000001	1.2934657
140	.0812386	6.0092714							
	.1021562	6.0271011	3.4101417	1.2432111	.62532	.78037	.2605698	.0000002	1.4658577
141	.1241164	6.0436297							
	.1491852	6.0603449	2.5971844	1.2667705	.54000	.84167	.2896805	.0000007	1.6167746
142	.1750100	6.0762820							
	.2038299	6.0922922	2.6466960	1.2893538	.46974	.88281	.3094068	.0000004	1.7628278
143	.2332099	6.1072499							
	.2655795	6.1224563	2.3532172	1.3109792	.41206	.91115	.3232510	.0000004	1.9039567
144	.2983746	6.1367220							
	.3342397	6.1512396	2.1065070	1.3317612	.36425	.93130	.3333956	.0000003	2.0407428
145	.3704374	6.1649070							
	.4098453	6.1788353	1.8969804	1.3518226	.32392	.94609	.3412129	.0000004	2.1738538
146	.4495205	6.1919830							
	.4925903	6.2053987	1.7168610	1.3712862	.28933	.95723	.3475727	.0000003	2.3039707
147	-.5358801	6.2180863							
	.5827839	6.2310433	1.5631403	1.3932481	.25919	.96583	.3530473	.0000005	2.4316530
148	.6298728	6.2433105							
	.6808255	6.2558419	1.4222470	1.4087994	.23251	.97259	.3580310	.0000004	2.5573842
149	.7319366	6.2677103							
	.7871896	6.2758304	1.2996996	1.4270060	.20855	.97801	.3628086	.0000004	2.6815254
150	.6425804	6.2913041							
	.9024184	6.3030087	1.1898101	1.4449346	.18673	.98241	.3676046	.0000004	2.8044268
151	.9623779	6.3140746							
	1.0271180	6.3253413	1.0904862	1.4626340	.16659	.98603	.3726003	.0000007	2.9263179
152	1.0919661	6.3359682							
	1.1619567	6.3467551	1.0030787	1.4801509	.14773	.98903	.3779572	.0000026	3.0474001
153	1.2320445	6.3568918							
	1.3076668	6.3671342	.9172558	1.4975363	.12982	.99154	.3838243	.0000007	3.1678803
154	1.3833770	6.3767759							
	1.4650454	6.3863122	.8407532	1.5148353	.11254	.99365	.3903452	.0000009	3.2878990

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 7.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
155	1.5467935	6.3952146							
	1.6349574	6.4040580	.7702755	1.5320995	.09555	.99542	.3976713	.0000007	3.4075960
156	1.7231938	6.4121470							
	1.8183392	6.4200526	.7044856	1.5493998	.07846	.99692	.4059772	.0000008	3.5271754
157	1.9135500	6.4271276							
	2.0162014	6.4338492	.6427977	1.5668233	.06071	.99816	.4154992	.0000009	3.6466558
158	2.1189107	6.4396189							
	2.2296323	6.4447989	.5876447	1.5845188	.04138	.99914	.4265348	.0000012	3.7671060
159	2.3404030	6.4487910							
	2.4606907	6.4515117	.5308812	1.6028419	.01749	.99985	.4421157	.0000011	3.8892415
160	2.5810000	6.4530000							
	2.7100000	6.4530000	.4646285	1.6216712	.00000	1.00000	.4657537	.0000013	4.0116441
161	2.8390000	6.4530000							
	2.9680000	6.4530000	.4209576	1.6393376	.00000	1.00000	.4863063	.0000012	4.1256456
162	3.0970000	6.4530000							
	3.2260000	6.4530000	.3833988	1.6553823	.00000	1.00000	.5055309	.0000016	4.2291821
163	3.3550000	6.4530000							
	3.4839999	6.4530000	.3516475	1.6700600	.00000	1.00000	.5248081	.0000012	4.3236972
164	3.6129999	6.4530000							
	3.7419999	6.4530000	.3245450	1.6835666	.00000	1.00000	.5446340	.0000014	4.4110553
165	3.8709999	6.4530000							
	3.9999999	6.4530000	.3005757	1.6960512	.00000	1.00000	.5653073	.0000013	4.4916185
166	4.1269999	6.4530000							
	4.2579998	6.4530000	.2793110	1.7076337	.00000	1.00000	.5870554	.0000016	4.5663603
167	4.3869998	6.4530000							
	4.5159998	6.4530000	.2602861	1.7184123	.00000	1.00000	.6100757	.0000017	4.6359144
168	4.6449998	6.4530000							
	4.7739998	6.4530000	.2431485	1.7284693	.00000	1.00000	.6345528	.0000016	4.7008124
169	4.9029998	6.4530000							
	5.0319998	6.4530000	.2276211	1.7378732	.00000	1.00000	.6606683	.0000019	4.7614955
170	5.1609997	6.4530000							
	5.2899997	6.4530000	.2134812	1.7466854	.00000	1.00000	.6886053	.0000017	4.8183610
171	5.4189997	6.4530000							
	5.5479996	6.4530000	.2005498	1.7549564	.00000	1.00000	.7185516	.0000016	4.8717334
172	5.6769996	6.4530000							
	5.8059996	6.4530000	.1886753	1.7627323	.00000	1.00000	.7507011	.0000018	4.9219118
173	5.9349996	6.4530000							
	6.0639995	6.4530000	.1777342	1.7700524	.00000	1.00000	.7852543	.0000020	4.9691485
174	6.1929995	6.4530000							
	6.3219995	6.4530000	.1676201	1.7769511	.00000	1.00000	.8224179	.0000028	5.0136656
175	6.4509995	6.4530000							
	6.5799995	6.4530000	.1582432	1.7834615	.00000	1.00000	.8624024	.0000023	5.0556768
176	6.7089995	6.4530000							
	6.8379995	6.4530000	.1495243	1.7896105	.00000	1.00000	.9054189	.0000020	5.0953566

POTENTIAL FLOW - EDDF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFQC1 PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
177	6.9669994	6.4530000							
	7.0959994	6.4530000	.1413979	1.7954225	.00000	1.00000	.9516726	.0000021	5.1328614
178	7.2249994	6.4530000							
	7.3539994	6.4530000	.1338082	1.8009205	.00000	1.00000	1.0013559	.0000028	5.1683402
179	7.4829993	6.4530000							
	7.6119993	6.4530000	.1266973	1.8061261	.00000	1.00000	1.0546345	.0000026	5.2019314
180	7.7409993	6.4530000							
	7.8699992	6.4530000	.1200237	1.8110560	.00000	1.00000	1.1116320	.0000032	5.2337441
181	7.9989992	6.4530000							
	8.1279991	6.4530000	.1137393	1.8157279	.00000	1.00000	1.1724082	.0000029	5.2638920
182	8.2569991	6.4530000							
	8.3859991	6.4530000	.1078185	1.8201575	.00000	1.00000	1.2369296	.0000039	5.2924765
183	8.5149990	6.4530000							
	8.6439990	6.4530000	.1022191	1.8243578	.00000	1.00000	1.3050357	.0000038	5.3195808
184	8.7729989	6.4530000							
	8.9019989	6.4530000	.0969126	1.8283421	.00000	1.00000	1.3763937	.0000045	5.3452916
185	9.0309988	6.4530000							
	9.1599988	6.4530000	.0918771	1.8321227	.00000	1.00000	1.4504493	.0000038	5.3696877
186	9.2889987	6.4530000							
	9.4179987	6.4530000	.0870900	1.8357076	.00000	1.00000	1.5263722	.0000039	5.3928340
187	9.5469986	6.4530000							
	9.6759986	6.4530000	.0825310	1.8391132	.00000	1.00000	1.6030035	.0000041	5.4147977
188	9.8049985	6.4530000							
	9.9339982	6.4530000	.0781887	1.8423423	.00000	1.00000	1.6788126	.0000038	5.4356328
189	10.0629981	6.4530000							
	10.1919980	6.4530000	.0740681	1.8454047	.00000	1.00000	1.7518789	.0000043	5.4553965
190	10.3209980	6.4530000							
	10.4499979	6.4530000	.0701486	1.8483093	.00000	1.00000	1.8199112	.0000048	5.4741402
191	10.5789980	6.4530000							
	10.7079979	6.4530000	.0664554	1.8510635	.00000	1.00000	1.8803348	.0000039	5.4919129
192	10.8369980	6.4530000							
	10.9659979	6.4530000	.0630423	1.8536724	.00000	1.00000	1.9304726	.0000053	5.5087481
193	11.0949980	6.4530000							
	11.2239980	6.4530000	.0602608	1.8561448	.00000	1.00000	1.9679354	.0000050	5.5247027
194	11.3529980	6.4530000							
	11.4819989	6.4530000	.0581722	1.8584901	.00000	1.00000	1.9917539	.0000046	5.5398366
195	11.6109999	6.4530000							
	11.7399999	6.4530000	.0553378	1.8607115	.00000	1.00000	2.0044218	.0000069	5.5541716
196	11.8690000	6.4530000							
	12.0237999	6.4530000	.0514572	1.8630157	.00000	1.00000	2.0116857	.0000058	5.5690400
197	12.1786000	6.4530000							
	12.3643600	6.4530000	.0470793	1.8655887	.00000	1.00000	2.0174501	.0000062	5.5856442
198	12.5501200	6.4530000							
	12.7730319	6.4530000	.0426506	1.8684198	.00000	1.00000	2.0230547	.0000053	5.6039127

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.3 2-BODY CASE NO. BF0C1 PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
199	12.9959440	6.4530000							
	13.2634380	6.4530000	.0378041	1.8714706	.00000	1.00000	2.0287588	.0000060	5.6235999
200	13.5309319	6.4530000							
	13.8519255	6.4530000	.0323629	1.8746645	.00000	1.00000	2.0344959	.0000045	5.6442103
201	14.1729190	6.4530000							
	14.5581110	6.4530000	.0262640	1.8778643	.00000	1.00000	2.0400133	.0000034	5.6648582
202	14.9433030	6.4530000							
	15.4055330	6.4530000	.0194257	1.8808542	.00000	1.00000	2.0449665	.0000020	5.6841524
203	15.8677630	6.4530000							
	16.3710690	6.4530000	.0120898	1.8832016	.00000	1.00000	2.0486218	.0000036	5.6993002
204	16.8743751	6.4530000							
	17.3776810	6.4530000	.0047657	1.8845120	.00000	1.00000	2.0503102	.0000030	5.7077560
205	17.8809869	6.4530000							
	18.3842928	6.4530000	-.0024293	1.8846944	.00000	1.00000	2.0499340	.0000030	5.7089327
206	18.8875990	6.4530000							
	19.3909049	6.4530000	-.0096805	1.8837565	.00000	1.00000	2.0474599	.0000027	5.7028804
207	19.8942111	6.4530000							
	20.3975165	6.4530000	-.0171903	1.8816706	.00000	1.00000	2.0427760	.0000024	5.6894206
208	20.9008219	6.4530000							
	21.4041278	6.4530000	-.0251813	1.8783837	.00000	1.00000	2.0356762	.0000021	5.6682101
209	21.9074340	6.4530000							
	22.4107399	6.4530000	-.0338870	1.8738019	.00000	1.00000	2.0259479	.0000016	5.6386437
210	22.9140460	6.4530000							
	23.4173520	6.4530000	-.0436044	1.8677913	.00000	1.00000	2.0128549	.0000021	5.5998574
211	23.9206581	6.4530000							
	24.4239640	6.4530000	-.0546882	1.8601703	.00000	1.00000	1.9961080	.0000011	5.5506788
212	24.9272699	6.4530000							
	25.4305758	6.4530000	-.0676141	1.8506905	.00000	1.00000	1.9748285	.0000016	5.4895056
213	25.9338820	6.4530000							
	26.4371874	6.4530000	-.0829944	1.8393226	.00000	1.00000	1.9479924	.0000024	5.4142128
214	26.9404931	6.4530000							
	27.4437990	6.4530000	-.1016938	1.8247230	.00000	1.00000	1.9142579	.0000011	5.3219374
215	27.9471049	6.4530000							
	28.4504108	6.4530000	-.1249541	1.8071892	.00000	1.00000	1.8718507	.0000032	5.2087917
216	28.9537170	6.4530000							
	29.4570229	6.4530000	-.1546363	1.7855825	.00000	1.00000	1.8183978	.0000023	5.0693640
217	29.9603291	6.4530000							
	30.4636350	6.4530000	-.1937183	1.7587060	.00000	1.00000	1.7506424	.0000016	4.8959297
218	30.9669411	6.4530000							
	31.4702466	6.4530000	-.2473034	1.7247624	.00000	1.00000	1.6639274	.0000019	4.6768920
219	31.9735520	6.4530000							
	32.4768577	6.4530000	-.3252062	1.6808923	.00000	1.00000	1.5511266	.0000021	4.3937982
220	32.9801641	6.4530000							
	33.4634700	6.4530000	-.[illegible]499603	1.6220351	.00000	1.00000	1.4000548	.0000009	4.0139922

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.D 2-BODY CASE NO. 8FOC1 PSF =

ON-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	T2	T3	SIN A	COS A	SIGMA	N	PHI
221	33.9867759	6.4530000							
	34.4900818	6.4530000	-.6889676	1.5374299	.00000	1.00000	1.1856893	.0000013	3.4680348
222	34.9933882	6.4530000							
	35.4966941	6.4530000	-1.1993895	1.3981304	.00000	1.00000	.8453332	.0000007	2.5691355
223	36.0000000	6.4530000							

ADDED MASS = 6573.8681641 VOLUME = 1335.0665936

POTENTIAL FLOW - CODE RELEASE 2 DATE 053177

THE FOLLOWING NUMBERS ARE THE CARD IMAGES THAT GET PUNCHED WHEN THERE IS PUNCHED OUTPUT

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 .11409518+00 .10880690+00 .98550394-01 .85267998-01
 .70884794-01 .56709496-01 .43662034-01 .32366559-01
 .22849366-01 .14826439-01 .81654824-02 .26667006-02
-.18873438-02-.56865923-02-.88941716-02-.11609541-01
-.13900304-01-.15765240-01-.17130731-01-.17936612-01
-.18060576-01-.17836114-01-.17491231-01-.16748720-01
-.15459358-01-.13506151-01-.10817426-01-.73880056-02
-.34143288-02 .76483056-03 .50832191-02 .97445281-02
 .15011118-01 .21195447-01 .28566263-01 .37877786-01
 .49385082-01 .63875736-01 .92202705-01 .10540622+00
 .13470670+00 .17139681+00 .21643697+00 .26930103+00
 .32496093+00 .36666656+00 .35017522+00 .12869359+00
-.14737899+01-.89563487+00-.60198188+00-.43919077+00
-.33212972+00-.25537110+00-.19789664+00-.15388533+00
-.11977786+00-.93168617-01-.72302044-01-.55864509-01
-.42829894-01-.32408640-01-.23954506-01-.16957948-01
-.10788278-01-.56720918-02-.68564666-03 .43232082-02
 .94691063-02 .14633904-01 .19877739-01 .25458357-01
 .31707438-01 .39123923-01 .48035622-01 .79533237-01
 .74625253-01 .40144337-01 .29512584-01 .21264784-01
 .15969335-01 .12627943-01 .10795477-01 .10170737-01
 .10575647-01 .11873811-01 .13981674-01 .16824976-01
 .20402696-01 .24662370-01 .29627923-01 .35321413-01
 .41763304-01 .48998063-01 .57101514-01 .66105111-01
 .76158157-01 .87305283-01 .99621359-01 .11328666+00
 .12843428+00 .14524025+00 .16389017+00 .18459929+00
 .20763705+00 .23328133+00 .26188871+00 .29385097+00
 .32965009+00 .36985831+00 .41518370+00 .46653164+00
 .52507790+00 .59245334+00 .67098524+00 .76580523+00
 .88166076+00 .10249070+01 .11730337+01 .12980373+01
 .14302784+01 .15683420+01 .17147315+01 .18717134+01
 .20417148+01 .22276461+01 .24291258+01 .26479151+01
 .28861566+01 .31421092+01 .33997217+01 .36496350+01
 .38801667+01 .40779324+01 .43086671+01 .45953121+01
 .44573578+01 .39178016+01 .34101417+01 .29971844+01
 .26466960+01 .23532172+01 .21065070+01 .18969804+01
 .17162610+01 .15601403+01 .14222470+01 .12996996+01
 .11898101+01 .10904862+01 .10000787+01 .91725580+00
 .84095319+00 .77027540+00 .70448565+00 .64279766+00
 .58764467+00 .53088120+00 .46462852+00 .42095782+00
 .38339882+00 .35184747+00 .32454504+00 .30057568+00
 .27931104+00 .26028606+00 .24314854+00 .22762110+00
 .21348120+00 .20054979+00 .18867530+00 .17773419+00
 .16762012+00 .15824318+00 .14952430+00 .14139788+00
 .13380615+00 .12669734+00 .12002372+00 .11373929+00
 .10781849+00 .10221913+00 .96912592-01 .91877108-01
 .87089966-01 .82530973-01 .78198669-01 .74068068-01
 .70148650-01 .66455350-01 .63042279-01 .60260782-01
 .58172173-01 .55337759-01 .51457158-01 .47079348-01
 .42650642-01 .37804105-01 .32362849-01 .26264008-01
 .19425675-01 .12089820-01 .47657113-02-.24292532-02
-.96804611-02-.17190283-01-.25181254-01-.33887018-01
-.43504433-01-.54698239-01-.67614075-01-.82994433-01
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POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

-.10169383+00	-.12495409+00	-.1546[illegible]34+00	-.19371825+00
-.24730335+00	-.32520021+00	-.44996034+00	-.66896759+00
-.11993695+01			
.11578710+00	.11440660+00	.11209284+00	.10902587+00
.10533306+00	.10126045+00	.96962258-01	.92714682-01
.88594824-01	.84603891-01	.80794781-01	.77179953-01
.73803559-01	.70631400-01	.67680135-01	.64901441-01
.62309146-01	.59883639-01	.57623088-01	.55563748-01
.53636253-01	.51540881-01	.49357811-01	.46171427-01
.42909893-01	.39392382-01	.35648662-01	.32666892-01
.30506119-01	.29948339-01	.31169266-01	.34268856-01
.39445147-01	.47013998-01	.574[illegible]9804-01	.71352810-01
.89597031-01	.11327742+00	.14382060+00	.18305045+00
.23326592+00	.29730333+00	.37849084+00	.48031308+00
.60524610+00	.75156751+00	.90552761+00	.10195507+01
.68199672+00	.49162771+00	.37375567+00	.28515425+00
.22127192+00	.17245470+00	.13973122+00	.10543036+00
.82625255-01	.64875752-01	.51081195-01	.40396333-01
.32168612-01	.25894284-01	.21193594-01	.17782450-01
.15451670-01	.14062241-01	.13530463-01	.13831139-01
.14923289-01	.16590178-01	.18582284-01	.20764410-01
.23058534-01	.25429919-01	.27889581-01	.30651242-01
.34206346-01	.36710277-01	.38159102-01	.39178982-01
.39923638-01	.40507257-01	.40994972-01	.41498936-01
.41911[illegible]-01	.42433500-01	.43054208-01	.43802366-01
.44717527-01	.45813531-01	.47146022-01	.48734665-01
.50618261-01	.52838892-01	.55431977-01	.58443248-01
.61929062-01	.65933838-01	.70509270-01	.75735092-01
.81673518-01	.88404849-01	.96028060-01	.10463749+00
.11434710+00	.12528689+00	.13760029+00	.15144618+00
.16701393+00	.18450737+00	.20416950+00	.22628407+00
.25117503+00	.27924605+00	.31098714+00	.34704506+00
.38823539+[illegible]	.43827091+00	.46417557+00	.50168495+00
.5402189[illegible]	.57953830+00	.61998176+00	.65993960+00
.70085579+00	.74221154+00	.78360778+00	.82489267+00
.[illegible]35482+00	.90793176+00	.94863382+00	.98831909+00
.10278149+01	.10669064+01	.11041358+01	.11423435+01
.11820509+01	.12160127+01	.12432111+01	.12667705+01
.12893538+01	.13109792+01	.13317612+01	.13518226+01
.13712862+01	.13902481+01	.14087994+01	.14270060+01
.14449346+01	.14626340+01	.14801509+01	.14975363+01
.15148353+01	.15320955+01	.15493998+01	.15668233+01
.15845188+01	.16028419+01	.16216712+01	.16393376+01
.16553823+01	.16700600+01	.16835666+01	.16960512+01
.17076337+01	.17184123+01	.17284693+01	.17378732+01
.17466884+01	.17549564+01	.17627323+01	.17700524+01
.17769531+01	.17834615+01	.17896105+01	.17954225+01
.18009205+01	.18061261+01	.18110560+01	.18157279+01
.18201535+01	.18243578+01	.18283421+01	.18321227+01
.18357046+01	.18391132+01	.18423420+01	.18454047+01
.18483093+01	.18510635+01	.18536724+01	.18561448+01
.18584901+01	.18607115+01	.18630157+01	.18655887+01
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.18808542+01	.18832016+01	.18845120+01	.18846944+01
.18837565+01	.18816706+01	.18783837+01	.18738019+01
.18677933+01	.18601703+01	.18506905+01	.18390226+01
.18247230+01	.18071092+01	.17855825+01	.17587060+01

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.17247624+01 .16808923+01 .16220351+01 .15374299+01
.13981304+01
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POTENTIAL FLOW - CODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.3 2-BODY CASE NO. BFQC1 PSF =

OFF-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VZ	PHI
1	-.5000000	.0000000	.0000000	.8064446	.8064446	.0000000
2	-.5000000	.7222222	-.0851439	.8119302	.8083949	-.1383815
3	-.5000000	1.4444448	-.1735406	.8300357	.8141312	-.2684771
4	-.5000000	2.1666666	-.2687938	.8644395	.8246205	-.3799889
5	-.5000000	2.8888889	-.3749115	.9242969	.8413814	-.4582314
6	-.5000000	3.6111111	-.4948252	1.0299726	.8674894	-.4785107
7	-.5000000	4.3333333	-.6188942	1.2305389	.9093884	-.3926502
8	-.5000000	5.0555555	-.6426761	1.6407097	.9811263	-.0954171
9	-.5000000	5.7777777	.0003217	2.1056465	1.0984997	.5691096
10	-.5000000	6.4999999	.5999459	1.5132775	1.1816481	1.1820124
11	.0000000	.0000000	.0000000	.7446028	.7446028	.0000000
12	.0000000	.6111111	-.0797065	.7474942	.7456441	-.1554397
13	.0000000	1.2222222	-.1624112	.7570235	.7486919	-.3071543
14	.0000000	1.8333333	-.2516458	.7749160	.7541201	-.4507797
15	.0000000	2.4444444	-.3521733	.8028913	.7624695	-.5836301
16	.0000000	3.0555555	-.4712822	.8488665	.7747822	-.6881655
17	.0000000	3.6666665	-.6213967	.9264291	.7929910	-.7590332
18	.0000000	4.2777777	-.8259246	1.0713000	.8212179	-.7647899
19	.0000000	4.8888888	-1.1311668	1.4012444	.8698562	-.6362595
20	.0000000	5.4999999	-1.4856172	2.5755534	.9776317	-.1230254
21	.5000000	.0000000	.0000000	.6775147	.6775147	.0000000
22	.5000000	.5692158	-.0789960	.6787834	.6781696	-.1831910
23	.5000000	1.1384317	-.1609200	.6833721	.6794832	-.3648865
24	.5000000	1.7076475	-.2492287	.6913695	.6820196	-.5429984
25	.5000000	2.2768634	-.3486085	.7037499	.6857923	-.7154079
26	.5000000	2.8460792	-.4663101	.7221957	.6911097	-.8791264
27	.5000000	3.4152950	-.6150741	.7496771	.6984272	-1.0299601
28	.5000000	3.9845109	-.8206532	.7918474	.7085355	-1.1613436
29	.5000000	4.5537267	-1.1455809	.8593385	.7228334	-1.2621546
30	.5000000	5.1229426	-1.7923649	.9523843	.7432041	-1.3155508
31	1.0000000	.0000000	.0000000	.6075080	.6075080	.0000000
32	1.0000000	.5472980	-.0777250	.6074562	.6076269	-.2147439
33	1.0000000	1.0945960	-.1581107	.6079956	.6077136	-.4293952
34	1.0000000	1.6418940	-.2442469	.6083759	.6078731	-.6438358
35	1.0000000	2.1891920	-.3401505	.6082547	.6079995	-.8581645
36	1.0000000	2.7364900	-.4516888	.6064665	.6079217	-1.0729184
37	1.0000000	3.2837979	-.5882946	.6001762	.6072459	-1.2897212
38	1.0000000	3.8310859	-.7665540	.5820171	.6051595	-1.5126680
39	1.0000000	4.3783839	-1.0179502	.5306718	.5996130	-1.7530479
40	1.0000000	4.9256819	-1.3995792	.3786549	.5850365	-2.0439780
41	1.5000000	.0000000	.0000000	.5371677	.5371677	.0000000
42	1.5000000	.5370722	-.0751903	.5359491	.5369580	-.2486870
43	1.5000000	1.0741443	-.1525946	.5331074	.5358749	-.4985373

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.0 2-BODY CASE NO. BFOC1 PSF =

OFF-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VZ	PHI
44	1.5000000	1.6112165	-.2347021	.5272873	.5390785	-.7507004
45	1.5000000	2.1482886	-.3245164	.5173539	.5312518	-1.0070065
46	1.5000000	2.6853608	-.4259542	.5006494	.5269465	-1.2703192
47	1.5000000	3.2224329	-.5442644	.4719621	.5203938	-1.5954089
48	1.5000000	3.7595051	-.6861697	.4234634	.5101697	-1.8415194
49	1.5000000	4.2965772	-.8579109	.3223797	.4935126	-2.1761620
50	1.5000000	4.8336493	-1.0551419	.1212812	.4647340	-2.5872880
51	1.6980000	.0000000	.0000000	.5097785	.5097705	.0000000
52	1.6980000	.5354972	-.0738221	.5082492	.5093995	-.2627152
53	1.6980000	1.0709944	-.1496486	.5041540	.5079699	-.5269615
54	1.6980000	1.6064915	-.2296856	.4962719	.5055190	-.7943795
55	1.6980000	2.1419887	-.3164961	.4831598	.5017024	1.3673479
56	1.6980000	2.6774859	-.4131970	.4619001	.4960394	-1.3493473
57	1.6980000	3.2129831	-.5234776	.4270271	.4876872	-1.6460523
58	1.6980000	3.7484803	-.6508522	.3679702	.4751045	-1.9672607
59	1.6980000	4.2839774	-.7947421	.2638246	.4559089	-2.3308739
60	1.6980000	4.8194746	-.9330656	.0718866	.4250309	-2.7710515
61	2.6980000	.0000000	.0000000	.3811340	.3811340	.0000000
62	2.6980000	.5304882	-.0627459	.3783852	.3803447	-.3287198
63	2.6980000	1.0609764	-.1262553	.3704314	.3776408	-.6603084
64	2.6980000	1.5914646	-.1912237	.3561386	.3730523	-.9977650
65	2.6980000	2.1219528	-.2581045	.3341005	.3662514	-1.3447846
66	2.6980000	2.6524410	-.3268349	.3020507	.3568003	-1.7060280
67	2.6980000	3.1829292	-.3961[illegible]	.2567404	.3441202	-2.0876190
68	2.6980000	3.7134174	-.4624[illegible]	.1941317	.3273928	-2.4976714
69	2.6980000	4.2439057	-.5182[illegible]	.1106116	.3057396	-2.9463758
70	2.6980000	4.7743939	-.5508929	.0074036	.2784758	-3.4448409
71	3.6980000	.0000000	.0000000	.2761263	.2761263	.0000000
72	3.6980000	.5394769	-.0493820	.2730163	.2752379	-.3909924
73	3.6980000	1.0789537	-.0985992	.2640426	.2721650	-.7853002
74	3.6980000	1.6184306	-.1473479	.2484905	.2670593	-1.1862136
75	3.6980000	2.1579075	-.1949812	.2256420	.2597278	-1.5974390
76	3.6980000	2.6973844	-.2402891	.1946515	.2499528	-2.0231656
77	3.6980000	3.2368612	-.2812508	.1546612	.2375320	-2.4680032
78	3.6980000	3.7763381	-.3148427	.1053252	.2222794	-2.9369360
79	3.6980000	4.3158150	-.3371736	.0475444	.2041264	-3.4348430
80	3.6980000	4.8552918	-.3443050	-.0158324	.1832377	-3.9656191
81	11.6000000	2.6458126	-.0179944	.0048421	.0498203	-2.5139974
82	11.6000000	2.9934785	-.0186802	.0099980	.0449523	-2.8560497
83	11.6000000	3.3351444	-.0199347	.0135945	.0415385	-3.1966074
84	11.6000000	3.6798103	-.0216025	.0161984	.0390529	-3.5361030
85	11.6000000	4.0244761	-.0236707	.0181962	.0371824	-3.8748364
86	11.6000000	4.3691420	-.0262490	.0198772	.0357510	-4.2129410

POTENTIAL FLOW - EODF RELEASE 2 DATE 053177

DOUGLAS AIRCRAFT COMPANY
LONG BEACH DIVISION

TEST CASE RELEASE 2.D 2-BODY CASE NO. BFQC1 PSF =

OFF-BODY UNIFORM CROSS FLOW
TRANSFORMED COORDINATES

	X	Y	VX	VY	VZ	PHI
87	11.6000000	4.7138079	-.0295959	.0218590	.0346472	-4.5504879
88	11.6000000	5.0584738	-.0342771	.0231071	.0338119	-4.8874375
89	11.6000000	5.4031397	-.0417557	.0252876	.0331977	-5.2237679
90	11.6000000	5.7478055	-.0569475	.0281739	.0328045	-5.5592518

POTENTIAL FLOW - EDF RELEASE 2 DATE 053177

THE FOLLOWING NUMBERS ARE THE CARD IMAGES THAT GET PUNCHED WHEN THERE IS PUNCHED OUTPUT

```
 .00000000   -.85143926-01-.17354064+00-.26879381+00
-.37491148+00-.49482523+00-.61889422+00-.64260612+00
 .32167671-03 .59994587+00 .00000000   -.79736472-01
-.16241118+00-.25164577+00-.35217328+00-.47128225+00
-.62139667+00-.82592460+00-.11311666+01-.14856172+01
 .00000000   -.78996035-01-.16092030+00-.24922866+00
-.34860846+00-.46631005+00-.61527411+00-.82065324+00
-.11455809+01-.17923649+01 .00000000   -.77724960-01
-.15811073+00-.24424695+00-.34015046+00-.45168877+00
-.58829457+00-.76655402+00-.10179502+01-.13995792+01
 .00000000   -.75190304-01-.15259460+00-.23470213+00
-.32451642+00-.42595424+00-.54426444+00-.68616968+00
-.85791091+00-.10551419+01 .00000000   -.73822051-01
-.14964861+00-.22968557+00-.31649607+00-.41319700+00
-.52347764+00-.65085217+00-.79474214+00-.93306560+00
 .00000000   -.62745922-01-.12525535+00-.19122373+00
-.25810451+00-.32681493+00-.39612000+00-.46246718+00
-.51822978+00-.55089286+00 .00000000   -.49381966-01
-.98599222-01-.14734791+00-.19498116+00-.24028906+00
-.28125078+00-.31484273+00-.33717358+00-.34430499+00
-.17994388-01-.18680215-01-.19934701-01-.21602513-01
-.23670679-01-.26248994-01-.29595892-01-.34277149-01
-.41755331-01-.56947480-01
 .80644462+00 .81193022+00 .83003566+00 .86443947+00
 .92429692+00 .10299726+01 .12305389+01 .16407097+01
 .21056465+01 .15132775+01 .74460284+00 .74749424+00
 .75702353+00 .77441630+00 .80289131+00 .84896651+00
 .92642914+00 .10713000+01 .14012444+01 .25755534+01
 .67751466+00 .67878343+00 .68337211+00 .69136949+00
 .70374985+00 .72219574+00 .74967708+00 .79184739+00
 .85933846+00 .95238426+00 .60750799+00 .60745621+00
 .60799558+00 .60837577+00 .60825467+00 .60646647+00
 .60017616+00 .58201711+00 .53067178+00 .37865485+00
 .53716770+00 .53594914+00 .53310741+00 .52728729+00
 .51735392+00 .50064938+00 .47196211+00 .42046335+00
 .32237969+00 .12128124+00 .50977851+00 .50824921+00
 .50415395+00 .49627189+00 .48315975+00 .46190014+00
 .42702709+00 .36797020+00 .26382460+00 .71886644-01
 .38113403+00 .37838519+00 .37043139+00 .35613865+00
 .33410048+00 .30205068+00 .25674041+00 .19410168+00
 .11061159+00 .74035525-02 .27612627+00 .27301627+00
 .26404262+00 .24849054+00 .22564198+00 .19465148+00
 .15466122+00 .10532521+00 .47544360-01-.15832365-01
 .48421472-02 .99980086-02 .13594508-01 .16198426-01
 .18196195-01 .19877240-01 .21459028-01 .23187131-01
 .25287822-01 .28173923-01
 .80644462+00 .80839491+00 .81413129+00 .82462059+00
 .84138145+00 .86748935+00 .90938840+00 .98112629+00
 .10984997+01 .11818481+01 .74460284+00 .74564411+00
 .74869193+00 .75412014+00 .76246950+00 .77478221+00
 .79299095+00 .82121794+00 .86985601+00 .97763175+00
 .67751466+00 .67816959+00 .67948319+00 .68201961+00
 .68579234+00 .69110966+00 .69842720+00 .70853548+00
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POTENTIAL FLOW - EODF RELEASE 2

.72283040+00	.74320409+00	.60750799+00	.60762887+00
.60771355+00	.607[illegible]7034+00	.60799946+00	.60792169+00
.60724588+00	.60515948+00	.59961303+00	.58503655+00
.53716770+00	.53695798+00	.53587495+00	.53407849+00
.53125176+00	.52694654+00	.52039377+00	.51016974+00
.49351265+00	.46473403+00	.50977851+00	.50939952+00
.50796993+00	.50551902+00	.50170238+00	.49603944+00
.48768722+00	.47518446+00	.45590892+00	.42503038+00
.38113403+00	.38034470+00	.37764080+00	.37305234+00
.36625141+00	.35680830+00	.34412017+00	.32739276+00
.30573957+00	.27847578+00	.27612627+00	.27523795+00
.27216505+00	.26705934+00	.25972776+00	.24995281+00
.23753197+00	.22227940+00	.20412643+00	.18323773+00
.49820304-01	.44952273-01	.41538537-01	.39052889-01
.37182406-01	.35750955-01	.34647152-01	.33811852-01
.33197701-01	.32834459-01		

POTENTIAL FLOW - FODF RELEASE 2 DATE 053177

MATRIX SUMMATIONS FOR FINAL SOLUTIONS TOOK .000 SECONDS

NO ADDITIONAL CASES INPUT. NORMAL PROGRAM TERMINATION.

@FIN

Program COMBYN

(a) Printed Output (including input dump)

```
SOLUTION COMBINATION - COMBYN RELEASE 2-0                                              DATE 062377

               TEST CASE RELEASE 2.0
 221   90 221   90    1    0    0    0
     .000 746.140 -90.003 456.180  12.030   6.450    .000    .000 914.410  24.060
     .000    .000  11.740    .100
    2   81   90   -1    0    1    0    0
     .000 180.000
    11.60      2.40      6.00
     .0000     .0000     5.8600  48
```

SOLUTION COMBINATION - COMBYN RELEASE 2-0 DATE 062377

COMPRESSIBLE COMBYN APPROACH 5 TEST CASE RELEASE 2.0

INLET GEOMETRY IDENT= 3FOC1

LINEAR COMBINATION OF THE FOLLOWING BASIC FLOWS
A. UNIFORM AXISYMMETRIC (DUCT OPEN)
B. STRIP VORTEX ON SHROUD
C. UNIFORM CROSSFLOW (DUCT OPEN)

CURVED ELEMENTS(IGEOMF=0) PIECEWISE-PARABOLIC SOURCE DENSITIES(ISIGF=0) INTERNALLY-COMPUTED ELEMENT CURVATURES(ICURVN=0)

NEW VELOCITY FORMULAE ARE USED.

		MACH	DYNAMIC PRESSURE		PRESSURE RATIO		
	VELOCITY	NO	INC.	COMP.	INC.	COMP.	DENSITY RATIO
CONTROL	5.467+02	5.360-01	1.332+02	1.513+02	8.544-01	8.224-01	8.696-01
BULK	5.467+02	5.360-01	1.332+02	1.513+02	8.544-01	8.224-01	8.696-01
FREE STREAM	7.461+02	7.504-01	2.480+02	2.4 [illegible]02	7.289-01	6.883-01	7.658-01

ALFAF	VINF/VC	VINF/VA	VC/VA	VSONIC	VSONICC	WDOTCR
-9.000+01	1.365+00	1.365+00	1.000+00	6.070+02	9.575+02	2.554+01

TSTAT	PSTAT	PSTATC	ASTAT	RHOSTAT	WDOT	VIC
4.118+02	5.906+02	6.294+02	9.944+02	8.909-04	1.174+01	4.755+02

TTOT	PTOT	PTOTC	ATOT	RHOTOT	THET	DEL
4.582+02	9.144+02	9.144+02	1.049+03	1.163-03	8.834-01	4.321-01

XRI	YRIHUB	YRISHR	HUB-TIP RATIO	LND	P-S PLOT CUTOFF
0.000	0.000	5.860+00	4.000-01	1.000+00	2.406+01

XTEST	YTESTH	YTESTS	YWING
1.160+01	2.400+00	6.000+00	6.450+00

	NT		NJ	NCLO	NCHI	NHUBMX	NX	KND	KSKIP	NOTHET	ISWIRL
1	221	1	90	81	90	49	-1	0	0	1	0
2	221	2	90								

V1	V2	A	B	C	VINFP
9.897-01	-2.055+01	5.714+02	4.352+00	5.669-07	5.714+02

1 OF 2 THETAS

THETA = .00000 WDOTT = 1.17400+01 VICT = 4.75459+02 V3 = -3.34406-02

HUB
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	M	RB/RT	PSOPTC

SOLUTION COMBINATION - COMBYN RELEASE 2-0 DATE 062377

1	.8015+01	.1151+00	.4748+02	.0000	.4748+02	.4442+03	.0000	.9667-02	.4528-01	.8906	.9986
2	.8048+01	.3443+00	.1434+03	.0000	.1434+03	.4441+03	.0000	.2891-01	.1370+00	.8908	.9870
3	.8113+01	.5669+00	.2356+03	.0000	.2356+03	.4450+03	.0000	.4628-01	.2258+00	.8903	.9651
4	.8206+01	.7787+00	.3195+03	.0000	.3195+03	.4470+03	.0000	.6741-01	.3075+00	.8890	.9365
5	.8324+01	.9789+00	.3932+03	.0000	.3932+03	.4493+03	.0000	.8674-01	.3803+00	.8876	.9050
6	.8465+01	.1165+01	.4559+03	.0000	.4559+03	.4519+03	.0000	.1062+00	.4432+00	.8859	.8739
7	.8624+01	.1340+01	.5079+03	.0000	.5079+03	.4547+03	.0000	.1258+00	.4960+00	.8841	.8453
8	.8797+01	.1497+01	.5495+03	.0000	.5495+03	.4575+03	.0000	.1452+00	.5389+00	.8822	.8207
9	.8985+01	.1633+01	.5823+03	.0000	.5823+03	.4602+03	.0000	.1645+00	.5732+00	.8804	.8003
10	.9176+01	.1768+01	.6085+03	.0000	.6085+03	.4628+03	.0000	.1840+00	.6007+00	.8786	.7836
11	.9382+01	.1885+01	.6288+03	.0000	.6288+03	.4652+03	.0000	.2037+00	.6223+00	.8769	.7702
12	.9597+01	.1989+01	.6441+03	.0000	.6441+03	.4674+03	.0000	.2235+00	.6386+00	.8754	.7600
13	.9818+01	.2081+01	.6551+03	.0000	.6551+03	.4694+03	.0000	.2435+00	.6505+00	.8740	.7525
14	.1005+02	.2161+01	.6625+03	.0000	.6625+03	.4710+03	.0000	.2635+00	.6585+00	.8728	.7475
15	.1028+02	.2230+01	.6666+03	.0000	.6666+03	.4724+03	.0000	.2837+00	.6629+00	.8716	.7456
16	.1052+02	.2285+01	.6677+03	.0000	.6677+03	.4735+03	.0000	.3039+00	.6641+00	.8710	.7439
17	.1076+02	.2331+01	.6658+03	.0000	.6658+03	.4743+03	.0000	.3242+00	.6620+00	.8704	.7452
18	.1100+02	.2365+01	.6605+03	.0000	.6605+03	.4749+03	.0000	.3446+00	.6563+00	.8700	.7488
19	.1124+02	.2387+01	.6510+03	.0000	.6510+03	.4753+03	.0000	.3650+00	.6460+00	.8698	.7553
20	.1149+02	.2399+01	.6313+03	.0000	.6313+03	.4754+03	.0000	.3854+00	.6249+00	.8696	.7686
21	.1174+02	.2400+01	.6044+03	.0000	.6044+03	.4755+03	.0000	.4062+00	.5964+00	.8696	.7862
22	.1202+02	.2400+01	.5840+03	.0000	.5840+03	.4755+03	.0000	.4296+00	.5749+00	.8696	.7993
23	.1236+02	.2400+01	.5722+03	.0000	.5722+03	.4755+03	.0000	.4575+00	.5626+00	.8696	.8067
24	.1276+02	.2400+01	.5636+03	.0000	.5636+03	.4755+03	.0000	.4911+00	.5536+00	.8696	.8121
25	.1324+02	.2400+01	.5573+03	.0000	.5573+03	.4755+03	.0000	.5314+00	.5470+00	.8696	.8159
26	.1393+02	.2400+01	.5529+03	.0000	.5529+03	.4755+03	.0000	.5798+00	.5424+00	.8696	.8186
27	.1452+02	.2400+01	.5500+03	.0000	.5500+03	.4755+03	.0000	.6376+00	.5394+00	.8696	.8204
28	.1536+02	.2400+01	.5482+03	.0000	.5482+03	.4755+03	.0000	.7075+00	.5376+00	.8696	.8214
29	.1632+02	.2400+01	.5474+03	.0000	.5474+03	.4755+03	.0000	.7874+00	.5367+00	.8696	.8220
30	.1733+02	.2400+01	.5470+03	.0000	.5470+03	.4755+03	.0000	.8713+00	.5363+00	.8696	.8222
31	.1834+02	.2400+01	.5469+03	.0000	.5469+03	.4755+03	.0000	.9552+00	.5362+00	.8696	.8223
32	.1935+02	.2400+01	.5468+03	.0000	.5468+03	.4755+03	.0000	.1039+01	.5361+00	.8696	.8223
33	.2036+02	.2400+01	.5468+03	.0000	.5468+03	.4755+03	.0000	.1123+01	.5361+00	.8696	.8223
34	.2137+02	.2400+01	.5468+03	.0000	.5468+03	.4755+03	.0000	.1207+01	.5361+00	.8696	.8223
35	.2238+02	.2400+01	.5468+03	.0000	.5468+03	.4755+03	.0000	.1291+01	.5361+00	.8696	.8223
36	.2339+02	.2400+01	.5468+03	.0000	.5468+03	.4755+03	.0000	.1375+01	.5361+00	.8696	.8223
37	.2440+02	.2400+01	.5468+03	.0000	.5468+03	.4755+03	.0000	.1458+01	.5361+00	.8696	.8223
38	.2541+02	.2400+01	.5468+03	.0000	.5468+03	.4755+03	.0000	.1542+01	.5361+00	.8696	.8223
39	.2641+02	.2400+01	.5468+03	.0000	.5468+03	.4755+03	.0000	.1626+01	.5361+00	.8696	.8223
40	.2742+02	.2400+01	.5468+03	.0000	.5468+03	.4755+03	.0000	.17[illegible]+01	.5361+00	.8696	.8223
41	.2843+02	.2400+01	.5468+03	.0000	.5468+03	.4755+03	.0000	.1794+01	.5361+00	.8696	.8223
42	.2944+02	.2400+01	.5469+03	.0000	.5469+03	.4755+03	.0000	.1878+01	.5362+00	.8696	.8223
43	.3045+02	.2400+01	.5471+03	.0000	.5471+03	.4755+03	.0000	.1962+01	.5364+00	.8696	.8221
44	.3146+02	.2400+01	.5476+03	.0000	.5476+03	.4755+03	.0000	.2046+01	.5370+00	.8696	.8216
45	.3247+02	.2400+01	.5489+03	.0000	.5489+03	.4755+03	.0000	.2129+01	.5383+00	.8696	.8211
46	.3348+02	.2400+01	.5519+03	.0000	.5519+03	.4755+03	.0000	.2213+01	.5414+00	.8696	.8193
47	.3449+02	.2400+01	.5585+03	.0000	.5585+03	.4755+03	.0000	.2297+01	.5483+00	.8696	.8152
48	.3550+02	.2400+01	.5726+03	.0000	.5726+03	.4755+03	.0000	.2381+01	.5630+00	.8696	.8065

SHROUD
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	M	RB/RT	PSOPTC
49	.3550+02	.6000+01	-.5126+03	.0000	.5126+03	.4755+03	.0000	.2987+01	.5008+00	.8696	.8426
50	.3449+02	.6000+01	-.5347+03	.0000	.5347+03	.4755+03	.0000	.2903+01	.5236+00	.8696	.8295
51	.3348+02	.6000+01	-.5426+03	.0000	.5426+03	.4755+03	.0000	.2819+01	.5317+00	.8696	.8249
52	.3247+02	.6000+01	-.5452+03	.0000	.5452+03	.4755+03	.0000	.2735+01	.5344+00	.8696	.8233

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53	.3146+02	.6000+01	-.5461+03	.0000	.5461+03	.4755+03	.0000	.2652+01	.5354+00	.8696	.8227
54	.3045+02	.6000+01	-.5465+03	.0000	.5465+03	.4755+03	.0000	.2566+01	.5358+00	.8696	.8225
55	.2944+02	.6000+01	-.5467+03	.0000	.5467+03	.4755+03	.0000	.2484+01	.5360+00	.8696	.8224
56	.2843+02	.6000+01	-.5467+03	.0000	.5467+03	.4755+03	.0000	.2400+01	.5360+00	.8696	.8224
57	.2742+02	.6000+01	-.5467+03	.0000	.5467+03	.4755+03	.0000	.2316+01	.5360+00	.8696	.8224
58	.2641+02	.6000+01	-.5468+03	.0000	.5468+03	.4755+03	.0000	.2232+01	.5361+00	.8696	.8224
59	.2541+02	.6000+01	-.5468+03	.0000	.5468+03	.4755+03	.0000	.2148+01	.5361+00	.8696	.8224
60	.2440+02	.6000+01	-.5468+03	.0000	.5468+03	.4755+03	.0000	.2064+01	.5361+00	.8696	.8224
61	.2339+02	.6000+01	-.5468+03	.0000	.5468+03	.4755+03	.0000	.1981+01	.5361+00	.8696	.8225
62	.2238+02	.6000+01	-.5468+03	.0000	.5468+03	.4755+03	.0000	.1897+01	.5361+00	.8696	.8224
63	.2137+02	.6000+01	-.5468+03	.0000	.5468+03	.4755+03	.0000	.1813+01	.5361+00	.8696	.8224
64	.2036+02	.6000+01	-.5468+03	.0000	.5468+03	.4755+03	.0000	.1729+01	.5361+00	.8696	.8224
65	.1935+02	.6000+01	-.5467+03	.0000	.5467+03	.4755+03	.0000	.1645+01	.5360+00	.8696	.8224
66	.1834+02	.6000+01	-.5467+03	.0000	.5467+03	.4755+03	.0000	.1561+01	.5360+00	.8696	.8224
67	.1733+02	.6000+01	-.5466+03	.0000	.5466+03	.4755+03	.0000	.1477+01	.5359+00	.8696	.8225
68	.1632+02	.6000+01	-.5463+03	.0000	.5463+03	.4755+03	.0000	.1393+01	.5356+00	.8696	.8226
69	.1536+02	.6000+01	-.5458+03	.0000	.5458+03	.4755+03	.0000	.1314+01	.5350+00	.8696	.8229
70	.1452+02	.6000+01	-.5447+03	.0000	.5447+03	.4755+03	.0000	.1244+01	.5339+00	.8696	.8236
71	.1383+02	.6000+01	-.5429+03	.0000	.5429+03	.4755+03	.0000	.1186+01	.5321+00	.8696	.8247
72	.1324+02	.6000+01	-.5404+03	.0000	.5404+03	.4755+03	.0000	.1137+01	.5295+00	.8696	.8262
73	.1276+02	.6000+01	-.5370+03	.0000	.5370+03	.4755+03	.0000	.1097+01	.5259+00	.8696	.8282
74	.1236+02	.6000+01	-.5327+03	.0000	.5327+03	.4755+03	.0000	.1064+01	.5215+00	.8696	.8308
75	.1202+02	.6000+01	-.5275+03	.0000	.5275+03	.4755+03	.0000	.1036+01	.5162+00	.8696	.8339
76	.1174+02	.6000+01	-.5201+03	.0000	.5201+03	.4755+03	.0000	.1012+01	.5085+00	.8696	.8382
77	.1148+02	.5999+01	-.5115+03	.0000	.5115+03	.4754+03	.0000	.9912+00	.4997+00	.8696	.8432
78	.1123+02	.5995+01	-.5057+03	.0000	.5057+03	.4753+03	.0000	.9703+00	.4937+00	.8698	.8465
79	.1098+02	.5988+01	-.5033+03	.0000	.5033+03	.4749+03	.0000	.9495+00	.4913+00	.8700	.8479
80	.1074+02	.5975+01	-.5022+03	.0000	.5022+03	.4743+03	.0000	.9289+00	.4902+00	.8705	.8485
81	.1049+02	.5964+01	-.5021+03	.0000	.5021+03	.4734+03	.0000	.9084+00	.4901+00	.8712	.8486
82	.1024+02	.5948+01	-.5026+03	.0000	.5026+03	.4722+03	.0000	.8879+00	.4906+00	.8720	.8483
83	.9999+01	.5929+01	-.5037+03	.0000	.5037+03	.4707+03	.0000	.8675+00	.4917+00	.8731	.8477
84	.9756+01	.5937+01	-.5052+03	.0000	.5052+03	.4689+03	.0000	.8472+00	.4932+00	.8744	.8468
85	.9514+01	.5884+01	-.5070+03	.0000	.5070+03	.4665+03	.0000	.8270+00	.4951+00	.8760	.8458
86	.9272+01	.5855+01	-.5092+03	.0000	.5092+03	.4640+03	.0000	.8068+00	.4973+00	.8778	.8445
87	.9032+01	.5831+01	-.5116+03	.0000	.5116+03	.4609+03	.0000	.7867+00	.4998+00	.8799	.8431
88	.8792+01	.5802+01	-.5143+03	.0000	.5143+03	.4574+03	.0000	.7666+00	.5026+00	.8822	.8416
89	.8552+01	.5771+01	-.5172+03	.0000	.5172+03	.4535+03	.0000	.7465+00	.5056+00	.8849	.8399
90	.8313+01	.5739+01	-.5205+03	.0000	.5205+03	.4491+03	.0000	.7265+00	.5089+00	.8877	.8380
91	.8074+01	.5705+01	-.5240+03	.0000	.5240+03	.4442+03	.0000	.7064+00	.5125+00	.8908	.8359
92	.7836+01	.5673+01	-.5297+03	.0000	.5297+03	.4466+03	.0000	.6864+00	.5184+00	.8891	.8326
93	.7598+01	.5638+01	-.5366+03	.0000	.5366+03	.4522+03	.0000	.6665+00	.5255+00	.8856	.8285
94	.7361+01	.5603+01	-.5441+03	.0000	.5441+03	.4581+03	.0000	.6465+00	.5333+00	.8818	.8240
95	.7123+01	.5567+01	-.5523+03	.0000	.5523+03	.4640+03	.0000	.6265+00	.5418+00	.8778	.8192
96	.6885+01	.5531+01	-.5611+03	.0000	.5611+03	.4700+03	.0000	.6065+00	.5509+00	.8736	.8136
97	.6648+01	.5494+01	-.5705+03	.0000	.5705+03	.4763+03	.0000	.5865+00	.5608+00	.8690	.8077
98	.6410+01	.5455+01	-.5807+03	.0000	.5807+03	.4826+03	.0000	.5665+00	.5715+00	.8642	.8014
99	.6172+01	.5422+01	-.5916+03	.0000	.5916+03	.4891+03	.0000	.5466+00	.5829+00	.8592	.7945
100	.5935+01	.5385+01	-.6032+03	.0000	.6032+03	.4956+03	.0000	.5266+00	.5951+00	.8539	.7870
101	.5697+01	.5351+01	-.6154+03	.0000	.6154+03	.5021+03	.0000	.5066+00	.6081+00	.8483	.7790
102	.5459+01	.5317+01	-.6284+03	.0000	.6284+03	.5087+03	.0000	.4866+00	.6219+00	.8424	.7705
103	.5221+01	.5283+01	-.6421+03	.0000	.6421+03	.5152+03	.0000	.4667+00	.6365+00	.8364	.7614
104	.4983+01	.5250+01	-.6563+03	.0000	.6563+03	.5217+03	.0000	.4467+00	.6518+00	.8300	.7517
105	.4744+01	.5218+01	-.6712+03	.0000	.6712+03	.5280+03	.0000	.4267+00	.6679+00	.8235	.7415
106	.4505+01	.5189+01	-.6867+03	.0000	.6867+03	.5342+03	.0000	.4066+00	.6847+00	.8168	.7307
107	.4266+01	.5159+01	-.7027+03	.0000	.7027+03	.5402+03	.0000	.3866+00	.7022+00	.8099	.7190
108	.4026+01	.5132+01	-.7191+03	.0000	.7191+03	.5460+03	.0000	.3665+00	.7203+00	.8029	.7070
109	.3785+01	.5106+01	-.7359+03	.0000	.7359+03	.5514+03	.0000	.3464+00	.7388+00	.7959	.6950

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110	.3543+01	.5093+01	-.7527+03	.0000	.7527+03	.5565+03	.0000	[illegible]	[illegible]	.7890	.6835
111	.3301+01	.5062+01	-.7696+03	.0000	.7698+03	.5612+03	.0000	.3060+00	.7770+00	.7822	.6710
112	.3058+01	.5043+01	-.7867+03	.0000	.7867+03	.5654+03	.0000	[illegible]	[illegible]	.7758	[illegible]
113	.2813+01	.5025+01	-.8036+03	.0000	[illegible]	[illegible]	.0000	[illegible]	[illegible]	.7688	.6459
114	.2568+01	.5013+01	-.8203+03	.0000	.8203+03	.5721+03	.0000	.2449+00	[illegible]	.7646	.6336
115	.2321+01	.5002+01	-.8372+03	.0000	.8372+03	.5745+03	.0000	.2249+00	[illegible]	.7603	[illegible]
116	.2073+01	.4995+01	-.8556+03	.0000	.8556+03	.5762+03	.0000	[illegible]	[illegible]	[illegible]	[illegible]
117	.1823+01	.4991+01	-.8864+03	.0000	.8864+03	.5771+03	.0000	[illegible]	[illegible]	.7555	.5831
118	.1612+01	.4992+01	-.9229+03	.0000	.9229+03	.5767+03	.0000	.1654+00	.7571+00	.7560	.5550
119	.1445+01	.5000+01	-.9362+03	.0000	.9362+03	.5750+03	.0000	[illegible]	.7735+00	.7595	.5447
120	.1287+01	.5015+01	-.9264+03	.0000	.9264+03	.5714+03	.0000	[illegible]	.7615+00	[illegible]	.5522
121	.1137+01	.5039+01	-.9047+03	.0000	.9047+03	.5653+03	.0000	.1257+00	[illegible]	.7743	.5690
122	.9958+00	.5067+01	-.8742+03	.0000	.8742+03	.5600+03	.0000	.1137+00	[illegible]	[illegible]	.5924
123	.3630+00	.5101+01	-.8367+03	.0000	.8367+03	.5526+03	.0000	.1023+00	.3540+00	.7943	.6289
124	.7385+00	.5143+01	-.7931+03	.0000	.7931+03	.5443+03	.0000	.9150-01	.3035+00	[illegible]	.6537
125	.6222+00	.5183+01	-.7433+03	.0000	.7433+03	.5352+03	.0000	.8118-01	.7472+00	.8157	.6900
126	.5142+00	.5231+01	-.6867+03	.0000	.6867+03	.5254+03	.0000	.7134-01	[illegible]	[illegible]	.7207
127	.4154+00	.5284+01	-.6229+03	.0000	.6229+03	.5150+03	.0000	.6205-01	.6160+00	.8365	[illegible]
128	.3262+00	.5340+01	-.5506+03	.0000	.5506+03	.5043+03	.0000	.5329-01	[illegible]	.8464	.8200
129	.2463+00	.5400+01	-.4674+03	.0000	.4674+03	.4931+03	.0000	.4498-01	.4548+00	.8559	.8670
130	.1761+00	.5463+01	-.3713+03	.0000	.3713+03	.4817+03	.0000	.3710-01	.2585+00	.8650	[illegible]
131	.1177+00	.5529+01	-.2629+03	.0000	.2629+03	.4703+03	.0000	.2977-01	.2523+00	.8734	.9567
132	.7108-01	.5597+01	-.1424+03	.0000	.1424+03	.4590+03	.0000	.2296-01	.1360+00	.8812	.9872
133	.3566-01	.5667+01	-.8205+01	.0000	.8205+01	.4477+03	.0000	.1644-01	.7823-02	.8306	1.0000
134	.1221-01	.5738+01	.1525+03	.0000	.1525+03	.5714+03	.0000	.1018-01	.1457+00	.7658	.9853
135	.1035-02	.5807+01	.3573+03	.0000	.3573+03	.5714+03	.0000	.4388-02	.3447+00	.7658	.9211
136	.2703-02	.5874+01	.6523+03	.0000	.6523+03	.5714+03	.0000	-.1215-02	.6475+00	.7658	.7544
137	.2326-01	.5937+01	.9682+03	.0000	.9682+03	.5714+03	.0000	-.6723-02	.1014+01	.7658	.5200
138	.5969-01	.5988+01	.1097+04	.0000	.1097+04	.5714+03	.0000	-.1190-01	.1184+01	.7658	.4211
139	.1022+00	.6027+01	.1126+04	.0000	.1126+04	.5714+03	.0000	-.1671-01	.1224+01	.7658	.3990
140	.1492+00	.6061+01	.1123+04	.0000	.1123+04	.5714+03	.0000	-.2150-01	.1219+01	.7658	.4020
141	.2038+00	.6092+01	.1109+04	.0000	.1109+04	.5714+03	.0000	-.2676-01	.1200+01	.7658	.4124
142	.2656+00	.6122+01	.1091+04	.0000	.1091+04	.5714+03	.0000	-.3247-01	.1175+01	.7658	.4259
143	.3342+00	.6151+01	.1073+04	.0000	.1073+04	.5714+03	.0000	-.3866-01	.1150+01	.7658	.4399
144	.4098+00	.6179+01	.1055+04	.0000	.1055+04	.5714+03	.0000	-.4535-01	.1126+01	.7658	.4535
145	.4926+00	.6205+01	.1038+04	.0000	.1038+04	.5714+03	.0000	-.5257-01	.1104+01	.7658	.4662
146	.5828+00	.6231+01	.1023+04	.0000	.1023+04	.5714+03	.0000	-.6037-01	.1084+01	.7658	.4779
147	.6808+00	.6255+01	.1009+04	.0000	.1009+04	.5714+03	.0000	-.6877-01	.1065+01	.7658	.4886
148	.7872+00	.6280+01	.9960+03	.0000	.9960+03	.5714+03	.0000	-.7784-01	.1049+01	.7658	.4985
149	.9024+00	.6303+01	.9843+03	.0000	.9843+03	.5714+03	.0000	-.8761-01	.1034+01	.7658	.5076
150	.1027+01	.6325+01	.9735+03	.0000	.9735+03	.5714+03	.0000	-.9814-01	.1020+01	.7658	.5159
151	.1162+01	.6347+01	.9635+03	.0000	.9635+03	.5714+03	.0000	-.1095+00	.1008+01	.7658	.5236
152	.1308+01	.6367+01	.9542+03	.0000	.9542+03	.5714+03	.0000	-.1217+00	.9959+00	.7658	.5308
153	.1465+01	.6385+01	.9454+03	.0000	.9454+03	.5714+03	.0000	-.1349+00	.9850+00	.7658	.5376
154	.1635+01	.6404+01	.9371+03	.0000	.9371+03	.5714+03	.0000	-.1491+00	.9746+00	.7658	.5440
155	.1818+01	.6420+01	.9289+03	.0000	.9289+03	.5714+03	.0000	-.1644+00	.9646+00	.7658	.5503
156	.2016+01	.6434+01	.9207+03	.0000	.9207+03	.5714+03	.0000	-.1809+00	.9544+00	.7658	.5567
157	.2230+01	.6445+01	.9118+03	.0000	.9118+03	.5714+03	.0000	-.1987+00	.9435+00	.7658	.5635
158	.2461+01	.6452+01	.8958+03	.0000	.8958+03	.5714+03	.0000	-.2179+00	.9291+00	.7658	.5759
159	.2710+01	.6453+01	.8678+03	.0000	.8678+03	.5714+03	.0000	-.2385+00	.8906+00	.7658	.5973
160	.2969+01	.6453+01	.8443+03	.0000	.8443+03	.5714+03	.0000	-.2600+00	.8629+00	.7658	.6152
161	.3226+01	.6453+01	.8314+03	.0000	.8314+03	.5714+03	.0000	-.2815+00	.8478+00	.7658	.6250
162	.3484+01	.6453+01	.8218+03	.0000	.8218+03	.5714+03	.0000	-.3029+00	.8366+00	.7658	.6322
163	.3742+01	.6453+01	.8142+03	.0000	.8142+03	.5714+03	.0000	-.3244+00	.8278+00	.7658	.6379
164	.4000+01	.6453+01	.8080+03	.0000	.8080+03	.5714+03	.0000	-.3458+00	.8206+00	.7658	.6426
165	.4258+01	.6453+01	.8029+03	.0000	.8029+03	.5714+03	.0000	-.3673+00	.8147+00	.7658	.6465
166	.4516+01	.6453+01	.7985+03	.0000	.7985+03	.5714+03	.0000	-.3887+00	.8096+00	.7658	.6495

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167	.4774+01	.6453+01	.7947+03	.0000	.7947+03	.5714+03	.0000	-.4102+00	.8053+00	.7656	.6526
168	.5032+01	.6453+01	.7913+03	.0000	.7913+03	.5714+03	.0000	-.4316+00	.8015+00	.7658	.6551
169	.5290+01	.6453+01	.7884+03	.0000	.7884+03	.5714+03	.0000	-.4531+00	.7981+00	.7658	.6572
170	.5548+01	.6453+01	.7858+03	.0000	.7858+03	.5714+03	.0000	-.4745+00	.[illegible]952+00	.7658	.6592
171	.5806+01	.6453+01	.7835+03	.0000	.7835+03	.5714+03	.0000	-.4959+00	.7925+00	.7658	.6609
172	.6064+01	.6453+01	.7814+03	.0000	.7814+03	.5714+03	.0000	-.5174+00	.7902+00	.7658	.6624
173	.6322+01	.6453+01	.7795+03	.0000	.7795+03	.5714+03	.0000	-.5388+00	.7880+00	.7658	.6638
174	.6580+01	.6453+01	.7778+03	.0000	.7778+03	.5714+03	.0000	-.5603+00	.7861+00	.7658	.6651
175	.6838+01	.6453+01	.7763+03	.0000	.7763+03	.5714+03	.0000	-.5817+00	.7843+00	.7658	.6662
176	.7095+01	.6453+01	.7748+03	.0000	.7748+03	.5714+03	.0000	-.6032+00	.7827+00	.7658	.6673
177	.7354+01	.6453+01	.7735+03	.0000	.7735+03	.5714+03	.0000	-.6246+00	.7812+00	.7658	.6683
178	.7612+01	.6453+01	.7723+03	.0000	.7723+03	.5714+03	.0000	-.6461+00	.7798+00	.7658	.6691
179	.7870+01	.6453+01	.7712+03	.0000	.7712+03	.5714+03	.0000	-.6675+00	.7786+00	.7658	.6700
180	.8128+01	.6453+01	.7702+03	.0000	.7702+03	.5714+03	.0000	-.6890+00	.7774+00	.7658	.6707
181	.8385+01	.6453+01	.7692+03	.0000	.7692+03	.5714+03	.0000	-.7104+00	.7763+00	.7658	.6714
182	.8644+01	.6453+01	.7683+03	.0000	.7683+03	.5714+03	.0000	-.7319+00	.7753+00	.7658	.6721
183	.8902+01	.6453+01	.7675+03	.0000	.7675+03	.5714+03	.0000	-.7533+00	.7744+00	.7658	.6727
184	.9160+01	.6453+01	.7667+03	.0000	.7667+03	.5714+03	.0000	-.7747+00	.7735+00	.7658	.6733
185	.9418+01	.6453+01	.7660+03	.0000	.7660+03	.5714+03	.0000	-.7962+00	.7727+00	.7658	.6738
186	.9676+01	.6453+01	.7653+03	.0000	.7653+03	.5714+03	.0000	-.8176+00	.7719+00	.7658	.6743
187	.9934+01	.6453+01	.7647+03	.0000	.7647+03	.5714+03	.0000	-.8391+00	.7712+00	.7658	.6748
188	.1019+02	.6453+01	.7641+03	.0000	.7641+03	.5714+03	.0000	-.8605+00	.7705+00	.7658	.6752
189	.1045+02	.6453+01	.7635+03	.0000	.7635+03	.5714+03	.0000	-.8820+00	.7699+00	.7658	.6756
190	.1071+02	.6453+01	.7630+03	.0000	.7630+03	.5714+03	.0000	-.9034+00	.7693+00	.7658	.6760
191	.1097+02	.6453+01	.7625+03	.0000	.7625+03	.5714+03	.0000	-.9249+00	.7687+00	.7658	.6764
192	.1122+02	.6453+01	.7620+03	.0000	.7620+03	.5714+03	.0000	-.9463+00	.7682+00	.7658	.6768
193	.1148+02	.6453+01	.7615+03	.0000	.7615+03	.5714+03	.0000	-.9678+00	.7675+00	.7658	.6771
194	.1174+02	.6453+01	.7611+03	.0000	.7611+03	.5714+03	.0000	-.9892+00	.7672+00	.7658	.6774
195	.1202+02	.6453+01	.7608+03	.0000	.7608+03	.5714+03	.0000	-.1013+01	.7668+00	.7658	.6777
196	.1236+02	.6453+01	.7603+03	.0000	.7603+03	.5714+03	.0000	-.1041+01	.7662+00	.7658	.6780
197	.1277+02	.6453+01	.7597+03	.0000	.7597+03	.5714+03	.0000	-.1075+01	.7656+00	.7658	.6784
198	.1326+02	.6453+01	.7591+03	.0000	.7591+03	.5714+03	.0000	-.1116+01	.7650+00	.7658	.6788
199	.1385+02	.6453+01	.7585+03	.0000	.7585+03	.5714+03	.0000	-.1165+01	.7642+00	.7658	.6793
200	.1456+02	.6453+01	.7578+03	.0000	.7578+03	.5714+03	.0000	-.1223+01	.7635+00	.7658	.6798
201	.1541+02	.6453+01	.7571+03	.0000	.7571+03	.5714+03	.0000	-.1294+01	.7627+00	.7658	.6803
202	.1637+02	.6453+01	.7565+03	.0000	.7565+03	.5714+03	.0000	-.1374+01	.7619+00	.7658	.6808
203	.1738+02	.6453+01	.7559+03	.0000	.7559+03	.5714+03	.0000	-.1458+01	.7613+00	.7658	.6812
204	.1838+02	.6453+01	.7555+03	.0000	.7555+03	.5714+03	.0000	-.1542+01	.7608+00	.7658	.6815
205	.1939+02	.6453+01	.7551+03	.0000	.7551+03	.5714+03	.0000	-.1625+01	.7604+00	.7658	.6818
206	.2040+02	.6453+01	.7549+03	.0000	.7549+03	.5714+03	.0000	-.1709+01	.7602+00	.7658	.6820
207	.2140+02	.6453+01	.7547+03	.0000	.7547+03	.5714+03	.0000	-.1793+01	.7600+00	.7658	.6821
208	.2241+02	.6453+01	.7547+03	.0000	.7547+03	.5714+03	.0000	-.1876+01	.7600+00	.7658	.6821
209	.2342+02	.6453+01	.7547+03	.0000	.7547+03	.5714+03	.0000	-.1960+01	.7600+00	.7658	.6821
210	.2442+02	.6453+01	.7549+03	.0000	.7549+03	.5714+03	.0000	-.2044+01	.7602+00	.7658	.6819
211	.2543+02	.6453+01	.7552+03	.0000	.7552+03	.5714+03	.0000	-.2127+01	.7605+00	.7658	.6817
212	.2644+02	.6453+01	.7556+03	.0000	.7556+03	.5714+03	.0000	-.2211+01	.7610+00	.7658	.6814
213	.2744+02	.6453+01	.7562+03	.0000	.7562+03	.5714+03	.0000	-.2295+01	.7617+00	.7658	.6810
214	.2845+02	.6453+01	.7571+03	.0000	.7571+03	.5714+03	.0000	-.2378+01	.7626+00	.7658	.6804
215	.2946+02	.6453+01	.7582+03	.0000	.7582+03	.5714+03	.0000	-.2462+01	.7640+00	.7658	.6795
216	.3046+02	.6453+01	.7599+03	.0000	.7599+03	.5714+03	.0000	-.2546+01	.7659+00	.7658	.6783
217	.3147+02	.6453+01	.7624+03	.0000	.7624+03	.5714+03	.0000	-.2629+01	.7686+00	.7658	.6765
218	.3248+02	.6453+01	.7662+03	.0000	.7662+03	.5714+03	.0000	-.2713+01	.7729+00	.7658	.6737
219	.3348+02	.6453+01	.7728+03	.0000	.7728+03	.5714+03	.0000	-.2797+01	.7804+00	.7658	.6688
220	.3449+02	.6453+01	.7867+03	.0000	.7867+03	.5714+03	.0000	-.2880+01	.7962+00	.7658	.6585
221	.3550+02	.6453+01	.8209+03	.0000	.8209+03	.5714+03	.0000	-.2964+01	.8355+00	.7658	.6329

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OFF-BODY POINTS (RAKES)

	COORDINATES		VELOCITIES							PRESS.RATIO	
	AXIAL	RADIAL	AXIAL	RADIAL	CIRCUMFRNTL	RESULTANT	MERIDIONAL	CHORDWISE	SPANWISE	COMP	
I	X	R	VX	VY	VZ	VRES	VM	VAFT	VSPAN	RHOBR	PSOPTC
	-5.0000-01	0.0000	5.9163+02	0.0000	0.0000	5.9163+02	0.0000	0.0000	0.0000		.7944
1	-5.0000-01	0.0000	5.9163+02	5.1903-07	0.0000	5.9163+02	5.9163+02	5.1903-07	0.0000	.9014	.7944
2	-5.0000-01	7.2222-01	5.9108+02	-2.6467+00	0.0000	5.9108+02	5.9108+02	-2.6467+00	0.0000	.9014	.7948
3	-5.0000-01	1.4444+00	5.8918+02	-5.7862+00	0.0000	5.8921+02	5.8921+02	-5.7862+00	0.0000	.9014	.7960
4	-5.0000-01	2.1667+00	5.8512+02	-9.9601+00	0.0000	5.8521+02	5.8521+02	-9.9601+00	0.0000	.9014	.7985
5	-5.0000-01	2.8889+00	5.7700+02	-1.5744+01	0.0000	5.7721+02	5.7721+02	-1.5744+01	0.0000	.9014	.8036
6	-5.0000-01	3.6111+00	5.6035+02	-2.3313+01	0.0000	5.6084+02	5.6084+02	-2.3313+01	0.0000	.9014	.8138
7	-5.0000-01	4.3333+00	5.2445+02	-2.9416+01	0.0000	5.2527+02	5.2527+02	-2.9416+01	0.0000	.9014	.8352
8	-5.0000-01	5.0556+00	4.4885+02	-8.4441+00	0.0000	4.4893+02	4.4893+02	-8.4441+00	0.0000	.9014	.8775
9	-5.0000-01	5.7778+00	4.1327+02	1.3327+02	0.0000	4.3422+02	4.3422+02	1.3327+02	0.0000	.9014	.8851
10	-5.0000-01	6.5030+00	5.7650+02	1.7265+02	0.0000	6.0179+02	6.0179+02	1.7265+02	0.0000	.9014	.7879
	-5.0000-01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		.0000
	0.0000	0.0000	5.9607+02	0.0000	0.0000	5.9607+02	0.0000	0.0000	0.0000		.7916
11	0.0000	0.0000	5.9607+02	4.7963-07	0.0000	5.9607+02	5.9607+02	4.7963-07	0.0000	.9014	.7916
12	0.0000	6.1111-01	5.9590+02	-2.6549+00	0.0000	5.9591+02	5.9591+02	-2.6549+00	0.0000	.9014	.7917
13	0.0000	1.2222+00	5.9531+02	-5.7610+00	0.0000	5.9534+02	5.9534+02	-5.7610+00	0.0000	.9014	.7921
14	0.0000	1.8333+00	5.9401+02	-9.8581+00	0.0000	5.9409+02	5.9409+02	-9.8581+00	0.0000	.9014	.7929
15	0.0000	2.4444+00	5.9137+02	-1.5707+01	0.0000	5.9158+02	5.9158+02	-1.5707+01	0.0000	.9014	.7945
16	0.0000	3.0556+00	5.8600+02	-2.4525+01	0.0000	5.8652+02	5.8652+02	-2.4525+01	0.0000	.9014	.7977
17	0.0000	3.6667+00	5.7466+02	-3.8451+01	0.0000	5.7595+02	5.7595+02	-3.8451+01	0.0000	.9014	.8044
18	0.0000	4.2778+00	5.4835+02	-6.1306+01	0.0000	5.5176+02	5.5176+02	-6.1306+01	0.0000	.9014	.8193
19	0.0000	4.8889+00	4.7610+02	-9.7428+01	0.0000	4.8596+02	4.8596+02	-9.7428+01	0.0000	.9014	.8576
20	0.0000	5.5000+00	2.0765+02	-8.7131+01	0.0000	2.2519+02	2.2519+02	-8.7131+01	0.0000	.9014	.9681
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		.0000
	5.0000-01	0.0000	6.3941+02	0.0000	0.0000	6.3941+02	0.0000	0.0000	0.0000		.7631
21	5.0000-01	0.0000	6.3941+02	4.5479-07	0.0000	6.3941+02	6.3941+02	4.6479-07	0.0000	.8277	.7631
22	5.0000-01	5.6922-01	6.3954+02	-2.6647+00	0.0000	6.3955+02	6.3955+02	-2.6647+00	0.0000	.8277	.7630
23	5.0000-01	1.1384+00	6.3990+02	-5.7895+00	0.0000	6.3992+02	6.3992+02	-5.7895+00	0.0000	.8277	.7628
24	5.0000-01	1.7076+00	6.4041+02	-9.9269+00	0.0000	6.4049+02	6.4049+02	-9.9269+00	0.0000	.8277	.7624
25	5.0000-01	2.2769+00	6.4095+02	-1.5865+01	0.0000	6.4114+02	6.4114+02	-1.5865+01	0.0000	.8277	.7620
26	5.0000-01	2.8451+00	6.4124+02	-2.4906+01	0.0000	6.4172+02	6.4172+02	-2.4906+01	0.0000	.8277	.7616
27	5.0000-01	3.4153+00	6.4076+02	-3.9538+01	0.0000	6.4198+02	6.4198+02	-3.9538+01	0.0000	.8277	.7614
28	5.0000-01	3.9845+00	6.3832+02	-6.5299+01	0.0000	6.4166+02	6.4166+02	-6.5299+01	0.0000	.8277	.7616
29	5.0000-01	4.5537+00	6.3064+02	-1.1717+02	0.0000	6.4143+02	6.4143+02	-1.1717+02	0.0000	.8277	.7618
30	5.0000-01	5.1229+00	6.1097+02	-2.4960+02	0.0000	6.5999+02	6.5999+02	-2.4960+02	0.0000	.8277	.7492
	5.0000-01	5.2382+00	6.0886+02	-2.9971+02	0.0000	6.7863+02	6.7863+02	-2.9971+02	0.0000		.7364
	1.0000+00	0.0000	6.7044+02	0.0000	0.0000	6.7044+02	0.0000	0.0000	0.0000		.7420
31	1.0000+00	0.0000	6.7044+02	4.3410-07	0.0000	6.7044+02	6.7044+02	4.3410-07	0.0000	.7837	.7420
32	1.0000+00	5.4730-01	6.7087+02	-2.2465+00	0.0000	6.7088+02	6.7088+02	-2.2465+00	0.0000	.7837	.7417
33	1.0000+00	1.0946+00	6.7221+02	-4.9127+00	0.0000	6.7223+02	6.7223+02	-4.9127+00	0.0000	.7837	.7408
34	1.0000+00	1.6419+00	6.7455+02	-8.4890+00	0.0000	6.7461+02	6.7461+02	-8.4890+00	0.0000	.7837	.7391
35	1.0000+00	2.1892+00	6.7814+02	-1.3641+01	0.0000	6.7828+02	6.7828+02	-1.3641+01	0.0000	.7837	.7366
36	1.0000+00	2.7365+00	6.8349+02	-2.1398+01	0.0000	6.8382+02	6.8382+02	-2.1398+01	0.0000	.7837	.7327
37	1.0000+00	3.2838+00	6.9183+02	-3.3550+01	0.0000	6.9265+02	6.9265+02	-3.3550+01	0.0000	.7837	.7266
38	1.0000+00	3.8311+00	7.0635+02	-5.3616+01	0.0000	7.0839+02	7.0839+02	-5.3616+01	0.0000	.7837	.7155
39	1.0000+00	4.3784+00	7.3657+02	-8.9575+01	0.0000	7.4200+02	7.4200+02	-8.9575+01	0.0000	.7837	.6913
40	1.0000+00	4.9257+00	8.1541+02	-1.6262+02	0.0000	8.3147+02	8.3147+02	-1.6262+02	0.0000	.7837	.6249
	1.0000+00	5.0650+00	8.5360+02	-1.9339+02	0.0000	8.7524+02	8.7524+02	-1.9339+02	0.0000		.5916
	1.5000+00	0.0000	6.9123+02	0.0000	0.0000	6.9123+02	0.0000	0.0000	0.0000		.7276
41	1.5000+00	0.0000	6.9123+02	3.9383-07	0.0000	6.9123+02	6.9123+02	3.9383-07	0.0000	.7580	.7276
42	1.5000+00	5.3737-01	6.9196+02	-1.3851+00	0.0000	6.9196+02	6.9196+02	-1.3861+00	0.0000	.7580	.7271
43	1.5000+00	1.0741+00	6.9419+02	-3.1095+00	0.0000	6.9420+02	6.9420+02	-3.1095+00	0.0000	.7580	.7255

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44	1.5000+00	1.6112+00	6.9816+02	-5.5414+00	0.0000	6.9818+02	6.9818+02	-5.5414+00	0.0000	.7580	.7227
45	1.5000+00	2.1483+00	7.0430+02	-9.1318+00	0.0000	7.0436+02	7.0436+02	-9.1318+00	0.0000	.7580	.7183
46	1.5000+00	2.6854+00	7.1356+02	-1.4463+01	0.0000	7.1370+02	7.1370+02	-1.4463+01	0.0000	.7580	.7117
47	1.5000+00	3.2224+00	7.2781+02	-2.2294+01	0.0000	7.2815+02	7.2815+02	-2.2294+01	0.0000	.7580	.7013
48	1.5000+00	3.7595+00	7.5118+02	-3.3448+01	0.0000	7.5193+02	7.5193+02	-3.3448+01	0.0000	.7580	.6841
49	1.5000+00	4.2956+00	7.9353+02	-4.7697+01	0.0000	7.9496+02	7.9496+02	-4.7697+01	0.0000	.7580	.6524
50	1.5000+00	4.8336+00	8.8304+02	-5.6916+01	0.0000	8.8488+02	8.8488+02	-5.6916+01	0.0000	.7580	.5842
	1.5000+00	4.9958+00	9.3293+02	-5.3603+01	0.0000	9.3447+02	9.3447+02	-5.3603+01	0.0000		.5460
	1.6980+00	0.0000	6.9397+02	0.0000	0.0000	6.9397+02	0.0000	0.0000	0.0000		.7256
51	1.6980+00	0.0000	6.9397+02	3.7478-07	0.0000	6.9397+02	6.9397+02	3.7478-07	0.0000	.7556	.7256
52	1.6980+00	5.3550-01	6.9479+02	-9.2902-01	0.0000	6.9479+02	6.9479+02	-9.2902-01	0.0000	.7556	.7251
53	1.6980+00	1.0710+00	6.9732+02	-2.1543+00	0.0000	6.9732+02	6.9732+02	-2.1543+00	0.0000	.7556	.7233
54	1.6980+00	1.6065+00	7.0179+02	-3.9899+00	0.0000	7.0180+02	7.0180+02	-3.9899+00	0.0000	.7556	.7201
55	1.6980+00	2.1420+00	7.0870+02	-6.7886+00	0.0000	7.0873+02	7.0873+02	-6.7886+00	0.0000	.7556	.7152
56	1.6980+00	2.6775+00	7.1901+02	-1.0947+01	0.0000	7.1910+02	7.1910+02	-1.0947+01	0.0000	.7556	.7078
57	1.6980+00	3.2130+00	7.3460+02	-1.6839+01	0.0000	7.3479+02	7.3479+02	-1.6839+01	0.0000	.7556	.6966
58	1.6980+00	3.7485+00	7.5921+02	-2.4439+01	0.0000	7.5961+02	7.5961+02	-2.4439+01	0.0000	.7556	.6785
59	1.6980+00	4.2840+00	8.0059+02	-3.1515+01	0.0000	8.0121+02	8.0121+02	-3.1515+01	0.0000	.7556	.6477
60	1.6980+00	4.8195+00	8.7398+02	-2.3930+01	0.0000	8.7431+02	8.7431+02	-2.3930+01	0.0000	.7556	.5923
	1.6980+00	4.9907+00	9.1068+02	-9.1526+00	0.0000	9.1073+02	9.1073+02	-9.1526+00	0.0000		.5644
	2.6980+00	0.0000	6.8369+02	0.0000	0.0000	6.8369+02	0.0000	0.0000	0.0000		.7328
61	2.6980+00	0.0000	6.8369+02	2.7682-07	0.0000	6.8369+02	6.8369+02	2.7682-07	0.0000	.7673	.7328
62	2.6980+00	5.3049-01	6.8477+02	1.9994+00	0.0000	6.8478+02	6.8478+02	1.9994+00	0.0000	.7673	.7321
63	2.6980+00	1.0610+00	6.8807+02	3.9021+00	0.0000	6.8808+02	6.8808+02	3.9021+00	0.0000	.7673	.7298
64	2.6980+00	1.5915+00	6.9372+02	5.6557+00	0.0000	6.9374+02	6.9374+02	5.6557+00	0.0000	.7673	.7258
65	2.6980+00	2.1220+00	7.0201+02	7.3033+00	0.0000	7.0205+02	7.0205+02	7.3033+00	0.0000	.7673	.7199
66	2.6980+00	2.6524+00	7.1344+02	9.0690+00	0.0000	7.1349+02	7.1349+02	9.0690+00	0.0000	.7673	.7118
67	2.6980+00	3.1829+00	7.2865+02	1.1505+01	0.0000	7.2874+02	7.2874+02	1.1505+01	0.0000	.7673	.7009
68	2.6980+00	3.7134+00	7.4832+02	1.5726+01	0.0000	7.4849+02	7.4849+02	1.5726+01	0.0000	.7673	.6866
69	2.6980+00	4.2439+00	7.7238+02	2.3596+01	0.0000	7.7274+02	7.7274+02	2.3596+01	0.0000	.7673	.6688
70	2.6980+00	4.7744+00	7.9855+02	3.6943+01	0.0000	7.9940+02	7.9940+02	3.6943+01	0.0000	.7673	.6490
	2.6980+00	5.0197+00	8.1018+02	4.4862+01	0.0000	8.1143+02	8.1143+02	4.4862+01	0.0000		.6400
	3.6980+00	0.0000	6.5045+02	0.0000	0.0000	6.5045+02	0.0000	0.0000	0.0000		.7557
71	3.6980+00	0.0000	6.5045+02	1.9479-07	0.0000	6.5045+02	6.5045+02	1.9479-07	0.0000	.7934	.7557
72	3.6980+00	5.3948-01	6.5164+02	5.4007+00	0.0000	6.5166+02	6.5166+02	5.4007+00	0.0000	.7934	.7549
73	3.6980+00	1.0790+00	6.5518+02	1.0723+01	0.0000	6.5527+02	6.5527+02	1.0723+01	0.0000	.7934	.7524
74	3.6980+00	1.6184+00	6.6096+02	1.5971+01	0.0000	6.6116+02	6.6116+02	1.5971+01	0.0000	.7934	.7484
75	3.6980+00	2.1579+00	6.6806+02	2.1287+01	0.0000	6.6920+02	6.6920+02	2.1287+01	0.0000	.7934	.7429
76	3.6980+00	2.6974+00	6.7874+02	2.7001+01	0.0000	6.7928+02	6.7928+02	2.7001+01	0.0000	.7934	.7359
77	3.6980+00	3.2369+00	6.9043+02	3.3634+01	0.0000	6.9125+02	6.9125+02	3.3634+01	0.0000	.7934	.7276
78	3.6980+00	3.7763+00	7.0361+02	4.1858+01	0.0000	7.0486+02	7.0486+02	4.1858+01	0.0000	.7934	.7180
79	3.6980+00	4.3158+00	7.1774+02	5.2364+01	0.0000	7.1964+02	7.1964+02	5.2364+01	0.0000	.7934	.7074
80	3.6980+00	4.8553+00	7.3204+02	5.5651+01	0.0000	7.3497+02	7.3497+02	6.5551+01	0.0000	.7934	.6964
	3.6980+00	5.0976+00	7.3833+02	7.2639+01	0.0000	7.4190+02	7.4190+02	7.2639+01	0.0000		.6914
	1.1600+01	2.3992+00	6.1822+02	4.7135+00	0.0000	6.1824+02	6.1824+02	4.7135+00	0.0000		.7772
81	1.1600+01	2.6458+00	6.0304+02	2.1175+01	0.0000	6.0342+02	6.0342+02	2.1175+01	0.0000	.8696	.7869
82	1.1600+01	2.9935+00	5.8536+02	2.9186+01	0.0000	5.8609+02	5.8609+02	2.9186+01	0.0000	.8696	.7980
83	1.1600+01	3.3351+00	5.7167+02	3.1038+01	0.0000	5.7252+02	5.7252+02	3.1038+01	0.0000	.8696	.8065
84	1.1600+01	3.6798+00	5.6076+02	3.0279+01	0.0000	5.6158+02	5.6158+02	3.0279+01	0.0000	.8696	.8133
85	1.1600+01	4.0245+00	5.5179+02	2.8254+01	0.0000	5.5251+02	5.5251+02	2.8254+01	0.0000	.8696	.8189
86	1.1600+01	4.3691+00	5.4416+02	2.5519+01	0.0000	5.4475+02	5.4475+02	2.5519+01	0.0000	.8696	.8236
87	1.1600+01	4.7138+00	5.3743+02	2.2270+01	0.0000	5.3789+02	5.3789+02	2.2270+01	0.0000	.8696	.8277
88	1.1600+01	5.0585+00	5.3129+02	1.8485+01	0.0000	5.3161+02	5.3161+02	1.8485+01	0.0000	.8696	.8314
89	1.1600+01	5.4031+00	5.2546+02	1.3931+01	0.0000	5.2565+02	5.2565+02	1.3931+01	0.0000	.8696	.8349
90	1.1600+01	5.7478+00	5.1970+02	7.9568+00	0.0000	5.1976+02	5.1976+02	7.9568+00	0.0000	.8696	.8384
	1.1600+01	6.0030+00	5.1505+02	1.5657+00	0.0000	5.1505+02	5.1505+02	1.5657+00	0.0000		.8411

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	COORDINATES		NEW CP		*------------		ANGLES		------------*	
	AXIAL	RADIAL			MERIDIONAL	FLOW	UNDERTURNG	SPANWISE	SWIRL	
I	X	Y	VBRI	M	ALPHA	BETA	ETA	ZETA	PHI	CFRACT
	-5.0000-01	0.0000		5.8293-01	5.0264-08	0.0000	0.0000	0.0000	0.0000	0.0000
1	-5.0000-01	0.0000	4.2634+02	5.8293-01	5.0264-08	0.0000	5.0264-08	0.0000	0.0000	0.0000
2	-5.0000-01	7.2222-01	4.2634+02	5.8235-01	-2.5655-01	0.0000	-2.5655-01	0.0000	0.0000	1.8213-02
3	-5.0000-01	1.4444+00	4.2634+02	5.8038-01	-5.6267-01	0.0000	-5.6267-01	0.0000	0.0000	7.2774-02
4	-5.0000-01	2.1667+00	4.2634+02	5.7618-01	-9.7521-01	0.0000	-9.7521-01	0.0000	0.0000	1.6339-01
5	-5.0000-01	2.8889+00	4.2634+02	5.6779-01	-1.5630+00	0.0000	-1.5630+00	0.0000	0.0000	2.8934-01
6	-5.0000-01	3.6111+00	4.2634+02	5.5069-01	-2.3823+00	0.0000	-2.3823+00	0.0000	0.0000	4.4982-01
7	-5.0000-01	4.3333+00	4.2634+02	5.1386-01	-3.2104+00	0.0000	-3.2104+00	0.0000	0.0000	6.3707-01
8	-5.0000-01	5.0556+00	4.2634+02	4.3608-01	-1.0778+00	0.0000	-1.0778+00	0.0000	0.0000	8.4143-01
9	-5.0000-01	5.7778+00	4.2634+02	4.2128-01	1.7874+01	0.0000	1.7874+01	0.0000	0.0000	1.0554+00
10	-5.0000-01	6.5000+00	4.2634+02	5.9364-01	1.6672+01	0.0000	1.6672+01	0.0000	0.0000	1.3243+00
	-5.0000-01	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.3243+00
	0.0000	0.0000		5.8760-01	4.6103-08	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	4.2634+02	5.8760-01	4.6103-08	0.0000	4.6103-08	0.0000	0.0000	0.0000
12	0.0000	6.1111-01	4.2634+02	5.8743-01	-2.5527-01	0.0000	-2.5527-01	0.0000	0.0000	1.3110-02
13	0.0000	1.2222+00	4.2634+02	5.8683-01	-5.5445-01	0.0000	-5.5445-01	0.0000	0.0000	5.2423-02
14	0.0000	1.8333+00	4.2634+02	5.8552-01	-9.5078-01	0.0000	-9.5078-01	0.0000	0.0000	1.1787-01
15	0.0000	2.4444+00	4.2634+02	5.8287-01	-1.5214+00	0.0000	-1.5214+00	0.0000	0.0000	2.0929-01
16	0.0000	3.0556+00	4.2634+02	5.7755-01	-2.3965+00	0.0000	-2.3965+00	0.0000	0.0000	3.2627-01
17	0.0000	3.6667+00	4.2634+02	5.6647-01	-3.8279+00	0.0000	-3.8279+00	0.0000	0.0000	4.6750-01
18	0.0000	4.2778+00	4.2634+02	5.4126-01	-6.3792+00	0.0000	-6.3792+00	0.0000	0.0000	6.3106-01
19	0.0000	4.8889+00	4.2634+02	4.7361-01	-1.1565+01	0.0000	-1.1565+01	0.0000	0.0000	8.0633-01
20	0.0000	5.5000+00	4.2634+02	2.1570-01	-2.2763+01	0.0000	-2.2763+01	0.0000	0.0000	9.4252-01
	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	9.4252-01
	5.0000-01	0.0000		6.3364-01	4.1648-08	0.0000	0.0000	0.0000	0.0000	0.0000
21	5.0000-01	0.0000	5.2396+02	6.3364-01	4.1648-08	0.0000	4.1648-08	0.0000	0.0000	0.0000
22	5.0000-01	5.6922-01	5.2396+02	6.3378-01	-2.3873-01	0.0000	-2.3873-01	0.0000	0.0000	1.1950-02
23	5.0000-01	1.1384+00	5.2396+02	6.3418-01	-5.1837-01	0.0000	-5.1837-01	0.0000	0.0000	4.7806-02
24	5.0000-01	1.7076+00	5.2396+02	6.3479-01	-8.8806-01	0.0000	-8.8806-01	0.0000	0.0000	1.0759-01
25	5.0000-01	2.2769+00	5.2396+02	6.3549-01	-1.4179+00	0.0000	-1.4179+00	0.0000	0.0000	1.9133-01
26	5.0000-01	2.8461+00	5.2396+02	6.3611-01	-2.2243+00	0.0000	-2.2243+00	0.0000	0.0000	2.9901-01
27	5.0000-01	3.4153+00	5.2396+02	6.3638-01	-3.5309+00	0.0000	-3.5309+00	0.0000	0.0000	4.3057-01
28	5.0000-01	3.9845+00	5.2396+02	6.3604-01	-5.8408+00	0.0000	-5.8408+00	0.0000	0.0000	5.8568-01
29	5.0000-01	4.5537+00	5.2396+02	6.3580-01	-1.0525+01	0.0000	-1.0525+01	0.0000	0.0000	7.6322-01
30	5.0000-01	5.1229+00	5.2396+02	6.5575-01	-2.2221+01	0.0000	-2.2221+01	0.0000	0.0000	9.5879-01
	5.0000-01	5.2392+00		6.7594-01	-2.6209+01	0.0000	-2.6209+01	0.0000	0.0000	1.0000+00
	1.0000+00	0.0000		6.6705-01	3.7098-08	0.0000	0.0000	0.0000	0.0000	0.0000
31	1.0000+00	0.0000	5.6022+02	6.6705-01	3.7098-08	0.0000	3.7098-08	0.0000	0.0000	0.0000
32	1.0000+00	5.4730-01	5.6022+02	6.6752-01	-1.9186-01	0.0000	-1.9186-01	0.0000	0.0000	1.1342-02
33	1.0000+00	1.0946+00	5.6022+02	6.6899-01	-4.1873-01	0.0000	-4.1873-01	0.0000	0.0000	4.5394-02
34	1.0000+00	1.6419+00	5.6022+02	6.7157-01	-7.2100-01	0.0000	-7.2100-01	0.0000	0.0000	1.0223-01
35	1.0000+00	2.1892+00	5.6022+02	6.7555-01	-1.1524+00	0.0000	-1.1524+00	0.0000	0.0000	1.8199-01
36	1.0000+00	2.7365+00	5.6022+02	6.8159-01	-1.7932+00	0.0000	-1.7932+00	0.0000	0.0000	2.8492-01
37	1.0000+00	3.2838+00	5.6022+02	6.9122-01	-2.7763+00	0.0000	-2.7763+00	0.0000	0.0000	4.1134-01
38	1.0000+00	3.8311+00	5.6022+02	7.0848-01	-4.3407+00	0.0000	-4.3407+00	0.0000	0.0000	5.6296-01
39	1.0000+00	4.3784+00	5.6022+02	7.4575-01	-6.9337+00	0.0000	-6.9337+00	0.0000	0.0000	7.3837-01
40	1.0000+00	4.9257+00	5.6022+02	8.4781-01	-1.1279+01	0.0000	-1.1279+01	0.0000	0.0000	9.4270-01
	1.0000+00	5.0660+00		8.9945-01	-1.2766+01	0.0000	-1.2766+01	0.0000	0.0000	1.0000+00
	1.5000+00	0.0000		6.8967-01	3.2644-08	0.0000	0.0000	0.0000	0.0000	0.0000
41	1.5000+00	0.0000	5.7578+02	6.8967-01	3.2644-08	0.0000	3.2644-08	0.0000	0.0000	0.0000
42	1.5000+00	5.3707-01	5.7578+02	6.9047-01	-1.1477-01	0.0000	-1.1477-01	0.0000	0.0000	1.1110-02
43	1.5000+00	1.0741+00	5.7578+02	6.9292-01	-2.5664-01	0.0000	-2.5664-01	0.0000	0.0000	4.4475-02

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44	1.5000+00	1.6112+00	5.7578+02	6.9727-01	-4.5476-01	0.0000	-4.5476-01	0.0000	0.0000	1.0021-01
45	1.5000+00	2.1483+00	5.7578+02	7.0406-01	-7.4284-01	0.0000	-7.4284-01	0.0000	0.0000	1.7854-01
46	1.5000+00	2.6854+00	5.7578+02	7.1434-01	-1.1612+00	0.0000	-1.1612+00	0.0000	0.0000	2.7979-01
47	1.5000+00	3.2224+00	5.7578+02	7.3032-01	-1.7546+00	0.0000	-1.7546+00	0.0000	0.0000	4.0454-01
48	1.5000+00	3.7595+00	5.7578+02	7.5686-01	-2.5496+00	0.0000	-2.5496+00	0.0000	0.0000	5.5370-01
49	1.5000+00	4.2966+00	5.7578+02	8.0562-01	-3.4398+00	0.0000	-3.4398+00	0.0000	0.0000	7.2886-01
50	1.5000+00	4.8336+00	5.7578+02	9.1099-01	-3.6879+00	0.0000	-3.6879+00	0.0000	0.0000	9.3233-01
	1.5000+00	4.9958+00		9.7138-01	-3.2884+00	0.0000	-3.2884+00	0.0000	0.0000	1.0000+00
	1.6980+00	0.0000		6.9266-01	3.0943-08	0.0000	0.0000	0.0000	0.0000	0.0000
51	1.6980+00	0.0000	5.7710+02	6.9266-01	3.0943-08	0.0000	3.0943-08	0.0000	0.0000	0.0000
52	1.6980+00	5.3550-01	5.7710+02	6.9356-01	-7.6611-02	0.0000	-7.6611-02	0.0000	0.0000	1.1060-02
53	1.6980+00	1.0710+00	5.7710+02	6.9633-01	-1.7701-01	0.0000	-1.7701-01	0.0000	0.0000	4.4282-02
54	1.6980+00	1.6065+00	5.7710+02	7.0125-01	-3.2574-01	0.0000	-3.2574-01	0.0000	0.0000	9.9794-02
55	1.6980+00	2.1420+00	5.7710+02	7.0887-01	-5.4882-01	0.0000	-5.4882-01	0.0000	0.0000	1.7783-01
56	1.6980+00	2.6775+00	5.7710+02	7.2030-01	-8.7223-01	0.0000	-8.7223-01	0.0000	0.0000	2.7877-01
57	1.6980+00	3.2130+00	5.7710+02	7.3771-01	-1.3132+00	0.0000	-1.3132+00	0.0000	0.0000	4.0321-01
58	1.6980+00	3.7485+00	5.7710+02	7.6549-01	-1.8437+00	0.0000	-1.8437+00	0.0000	0.0000	5.5207-01
59	1.6980+00	4.2840+00	5.7710+02	8.1279-01	-2.2543+00	0.0000	-2.2543+00	0.0000	0.0000	7.2681-01
60	1.6980+00	4.8195+00	5.7710+02	8.9835-01	-1.5684+00	0.0000	-1.5684+00	0.0000	0.0000	9.2924-01
	1.6980+00	4.9907+00		9.4225-01	-5.7582-01	0.0000	-5.7582-01	0.0000	0.0000	1.0000+00
	2.6980+00	0.0000		6.8144-01	2.3198-08	0.0000	0.0000	0.0000	0.0000	0.0000
61	2.6980+00	0.0000	5.7060+02	6.8144-01	2.3198-08	0.0000	2.3198-08	0.0000	0.0000	0.0000
62	2.6980+00	5.3059-01	5.7060+02	6.8263-01	1.6729-01	0.0000	1.6729-01	0.0000	0.0000	1.0745-02
63	2.6980+00	1.0610+00	5.7060+02	6.8623-01	3.2493-01	0.0000	3.2493-01	0.0000	0.0000	4.3034-02
64	2.6980+00	1.5915+00	5.7060+02	6.9241-01	4.6711-01	0.0000	4.6711-01	0.0000	0.0000	9.7035-02
65	2.6980+00	2.1220+00	5.7060+02	7.0152-01	5.9605-01	0.0000	5.9605-01	0.0000	0.0000	1.7303-01
66	2.6980+00	2.6524+00	5.7060+02	7.1411-01	7.2829-01	0.0000	7.2829-01	0.0000	0.0000	2.7143-01
67	2.6980+00	3.1829+00	5.7060+02	7.3098-01	9.0456-01	0.0000	9.0456-01	0.0000	0.0000	3.9280-01
68	2.6980+00	3.7134+00	5.7060+02	7.5300-01	1.2039+00	0.0000	1.2039+00	0.0000	0.0000	5.3781-01
69	2.6980+00	4.2439+00	5.7060+02	7.8033-01	1.7498+00	0.0000	1.7498+00	0.0000	0.0000	7.0723-01
70	2.6980+00	4.7744+00	5.7060+02	8.1072-01	2.6487+00	0.0000	2.6487+00	0.0000	0.0000	9.0161-01
	2.6980+00	5.0197+00		8.2455-01	3.1694+00	0.0000	3.1694+00	0.0000	0.0000	1.0000+00
	3.6980+00	0.0000		6.4547-01	1.7159-08	0.0000	0.0000	0.0000	0.0000	0.0000
71	3.6980+00	0.0000	5.5329+02	6.4547-01	1.7159-08	0.0000	1.7159-08	0.0000	0.0000	0.0000
72	3.6980+00	5.3948-01	5.5329+02	6.4678-01	4.7485-01	0.0000	4.7485-01	0.0000	0.0000	1.0805-02
73	3.6980+00	1.0790+00	5.5329+02	6.5066-01	9.3769-01	0.0000	9.3769-01	0.0000	0.0000	4.3286-02
74	3.6980+00	1.6184+00	5.5329+02	6.5701-01	1.3842+00	0.0000	1.3842+00	0.0000	0.0000	9.7640-02
75	3.6980+00	2.1579+00	5.5329+02	6.6571-01	1.8229+00	0.0000	1.8229+00	0.0000	0.0000	1.7417-01
76	3.6980+00	2.6974+00	5.5329+02	6.7654-01	2.2781+00	0.0000	2.2781+00	0.0000	0.0000	2.7329-01
77	3.6980+00	3.2369+00	5.5329+02	6.8969-01	2.7889+00	0.0000	2.7889+00	0.0000	0.0000	3.9545-01
78	3.6980+00	3.7763+00	5.5329+02	7.0460-01	3.4045+00	0.0000	3.4045+00	0.0000	0.0000	5.4115-01
79	3.6980+00	4.3158+00	5.5329+02	7.2090-01	4.1727+00	0.0000	4.1727+00	0.0000	0.0000	7.1084-01
80	3.6980+00	4.8553+00	5.5329+02	7.3791-01	5.1247+00	0.0000	5.1247+00	0.0000	0.0000	9.0487-01
	3.6980+00	5.0976+00		7.4563-01	5.6189+00	0.0000	5.6189+00	0.0000	0.0000	1.0000+00
	1.1600+01	2.3992+00		6.1106-01	4.3683-01	0.0000	4.3683-01	0.0000	0.0000	0.0000
81	1.1600+01	2.6458+00	4.7545+02	5.9535-01	2.0111+00	0.0000	2.0111+00	0.0000	0.0000	4.4343-02
82	1.1600+01	2.9905+00	4.7545+02	5.7710-01	2.8544+00	0.0000	2.8544+00	0.0000	0.0000	1.1234-01
83	1.1600+01	3.3351+00	4.7545+02	5.6288-01	3.1077+00	0.0000	3.1077+00	0.0000	0.0000	1.8731-01
84	1.1600+01	3.6798+00	4.7545+02	5.5147-01	3.0908+00	0.0000	3.0908+00	0.0000	0.0000	2.6925-01
85	1.1600+01	4.0245+00	4.7545+02	5.4203-01	2.9312+00	0.0000	2.9312+00	0.0000	0.0000	3.5815-01
86	1.1600+01	4.3691+00	4.7545+02	5.3399-01	2.6851+00	0.0000	2.6851+00	0.0000	0.0000	4.5400-01
87	1.1600+01	4.7138+00	4.7545+02	5.2688-01	2.3729+00	0.0000	2.3729+00	0.0000	0.0000	5.5675-01
88	1.1600+01	5.0585+00	4.7545+02	5.2039-01	1.9926+00	0.0000	1.9926+00	0.0000	0.0000	6.6635-01
89	1.1600+01	5.4031+00	4.7545+02	5.1425-01	1.5187+00	0.0000	1.5187+00	0.0000	0.0000	7.6274-01
90	1.1600+01	5.7478+00	4.7545+02	5.0819-01	8.7715-01	0.0000	8.7715-01	0.0000	0.0000	9.0581-01
	1.1600+01	6.0000+00		5.0335-01	1.7417-01	0.0000	1.7417-01	0.0000	0.0000	1.0000+00

RELATIVE ROTOR INLET DATA

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X = 11.6000 UTIP = .0000

Y	U	VZPRIME	VPRIM	MPRIME	BETAPR	VZPRST	VPRST	MPRS	BETAPS
2.3992+00	0.0000	0.0000	5.1824+02	5.1106-01	0.0000	0.0000	6.1824+02	6.1106-01	0.0000
2.6458+00	0.0000	0.0000	5.0342+02	5.9535-01	0.0000	0.0000	6.0342+02	5.9535-01	0.0000
2.9905+00	0.0000	0.0000	5.8609+02	5.7710-01	0.0000	0.0000	5.8609+02	5.7710-01	0.0000
3.3351+00	0.0000	0.0000	5.7252+02	5.6288-01	0.0000	0.0000	5.7252+02	5.6288-01	0.0000
3.6798+00	0.0000	0.0000	5.6158+02	5.5147-01	0.0000	0.0000	5.6158+02	5.5147-01	0.0000
4.0245+00	0.0000	0.0000	5.5251+02	5.4203-01	0.0000	0.0000	5.5251+02	5.4203-01	0.0000
4.3691+00	0.0000	0.0000	5.4475+02	5.3399-01	0.0000	0.0000	5.4475+02	5.3399-01	0.0000
4.7138+00	0.0000	0.0000	5.3789+02	5.2688-01	0.0000	0.0000	5.3789+02	5.2689-01	0.0000
5.0585+00	0.0000	0.0000	5.3161+02	5.2039-01	0.0000	0.0000	5.3161+02	5.2039-01	0.0000
5.4031+00	0.0000	0.0000	5.2565+02	5.1425-01	0.0000	0.0000	5.2565+02	5.1425-01	0.0000
5.7478+00	0.0000	0.0000	5.1976+02	5.0819-01	0.0000	0.0000	5.1976+02	5.0819-01	0.0000
6.0000+00	0.0000	0.0000	5.1505+02	5.0335-01	0.0000	0.0000	5.1505+02	5.0335-01	0.0000

RAKE WEIGHT FLOW DATA

I	X	(Q(I)-QBAR)/QBAR	QS TOT	QFR	QSTOTCR/ARAKE	MBAR	QWALL	QSTOT/QWALL
1	-5.0000-01	3.2925-01	1.5534+01	1.0000+00				
2	0.0000	-5.7484-02	1.1056+01	1.0000+00				
3	5.0000-01	-5.0493-03	1.1672+01	1.0000+00	4.2410+01	6.2048-01	1.0963+01	1.0646+00
4	1.0000+00	-3.7901-03	1.1686+01	1.0000+00	4.5399+01	7.0838-01	1.2295+01	9.5047-01
5	1.5000+00	-4.0959-03	1.1583+01	1.0000+00	4.6651+01	7.5580-01	1.2346+01	9.4629-01
6	1.6980+00	-3.3770-03	1.1691+01	1.0000+00	4.6800+01	7.6215-01	1.2308+01	9.4986-01
7	2.6980+00	-9.2453-04	1.1720+01	1.0000+00	4.6373+01	7.4445-01	1.2120+01	9.6701-01
8	3.6980+00	-5.8740-04	1.1724+01	1.0000+00	4.4982+01	6.9440-01	1.2036+01	9.7405-01
9	1.1600+01	0.0000	1.1731+01	1.0000+00	3.8671+01	5.3533-01	1.1241+01	1.0436+00

STREAMLINES

X = -.500

QSTRM	YSTRM
1.00000-01	1.66143+00
2.00000-01	2.37658+00
3.00000-01	2.93716+00
4.00000-01	3.39004+00
5.00000-01	3.80748+00
6.00000-01	4.19112+00
7.00000-01	4.55573+00
8.00000-01	4.90913+00
9.00000-01	5.25328+00
1.00000+00	5.59089+00

X = .000

QSTRM	YSTRM
1.00000-01	1.63546+00
2.00000-01	2.38234+00
3.00000-01	2.91832+00
4.00000-01	3.37391+00
5.00000-01	3.78719+00
6.00000-01	4.16150+00
7.00000-01	4.51815+00
8.00000-01	4.85683+00
9.00000-01	5.33922+00

X = .500

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QSTRM	YSTRM
1.00000-01	1.63534+00
2.00000-01	2.32269+00
3.00000-01	2.85034+00
4.00000-01	3.28303+00
5.00000-01	3.67009+00
6.00000-01	4.03043+00
7.00000-01	4.35104+00
8.00000-01	4.66078+00
9.00000-01	[illegible].95184+00
1.00000+00	5.23823+00

X = 1.000

QSTRM	YSTRM
1.00000-01	1.62041+00
2.00000-01	2.28495+00
3.00000-01	2.80183+00
4.00000-01	3.23472+00
5.00000-01	3.60595+00
6.00000-01	3.94924+00
7.00000-01	4.25983+00
8.00000-01	4.54383+00
9.00000-01	4.81143+00
1.00000+00	5.06604+00

X = 1.500

QSTRM	YSTRM
1.00000-01	1.60915+00
2.00000-01	2.26212+00
3.00000-01	2.77235+00
4.00000-01	3.20289+00
5.00000-01	3.56615+00
6.00000-01	3.90147+00
7.00000-01	4.20810+00
8.00000-01	4.49436+00
9.00000-01	4.74832+00
1.00000+00	4.99684+00

X = 1.698

QSTRM	YSTRM
1.00000-01	1.60790+00
2.00000-01	2.25959+00
3.00000-01	2.76884+00
4.00000-01	3.19919+00
5.00000-01	3.56118+00
6.00000-01	3.89538+00
7.00000-01	4.23183+00
8.00000-01	4.47760+00
9.00000-01	4.74219+00
1.00000+00	4.99068+00

X = 2.698

QSTRM	YSTRM
1.00000-01	1.61216+00
2.00000-01	2.26735+00
3.00000-01	2.77731+00
4.00000-01	3.20928+00

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5.00000-01	3.57509+00
6.00000-01	3.90814+00
7.00000-01	4.22127+00
8.00000-01	4.49710+00
9.00000-01	4.77001+00
1.00000+00	5.01972+00

X = 3.698

QSTRM	YSTRM
1.00000-01	1.63506+00
2.00000-01	2.29847+00
3.00000-01	2.81534+00
4.00000-01	3.25370+00
5.00000-01	3.62397+00
6.00000-01	3.96343+00
7.00000-01	4.28135+00
8.00000-01	4.56372+00
9.00000-01	4.84176+00
1.00000+00	5.09763+00

X = 11.600

QSTRM	YSTRM
1.00000-01	2.92792+00
2.00000-01	3.38851+00
3.00000-01	3.79901+00
4.00000-01	4.17496+00
5.00000-01	4.52346+00
6.00000-01	4.84982+00
7.00000-01	5.15811+00
8.00000-01	5.45147+00
9.00000-01	5.73153+00
1.00000+00	6.00004+00

2 OF 2 THETAS

THETA = .18000+03 WDOTT = 1.17400+01 V1CT = 4.75459+02 V3 = -3.34406-02

HUB
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	M	RB/RT	PSOPTC
1	.8015+01	.1151+00	.4748+02	.2112-14	.4748+02	.4442+03	.2549-14	.9667-02	.4526-01	.8908	.9966
2	.8048+01	.3443+00	.1434+03	.2137-14	.1434+03	.4441+03	.8540-15	.2891-01	.1370+00	.8908	.9870
3	.8113+01	.5669+00	.2356+03	.2141-14	.2356+03	.4450+03	.5206-15	.4618-01	.2258+00	.8903	.9652
4	.8206+01	.7787+00	.3195+03	.2124-14	.3195+03	.4470+03	.3808-15	.6741-01	.3075+00	.8890	.9365
5	.8324+01	.9789+00	.3932+03	.2087-14	.3932+03	.4493+03	.3041-15	.8674-01	.3803+00	.8876	.9050
6	.8465+01	.1166+01	.4559+03	.2036-14	.4559+03	.4519+03	.2559-15	.1062+00	.4432+00	.8859	.8739
7	.8624+01	.1340+01	.5079+03	.1974-14	.5079+03	.4547+03	.2227-15	.1258+00	.4960+00	.8841	.8453
8	.8797+01	.1497+01	.5495+03	.1906-14	.5495+03	.4575+03	.1988-15	.1452+00	.5359+00	.8822	.8207
9	.8980+01	.1638+01	.5823+03	.1837-14	.5823+03	.4602+03	.1807-15	.1645+00	.5732+00	.8804	.8003
10	.9176+01	.1768+01	.6085+03	.1766-14	.6085+03	.4628+03	.1663-15	.1840+00	.6007+00	.8786	.7836
11	.9382+01	.1885+01	.6288+03	.1696-14	.6286+03	.4652+03	.1545-15	.2037+00	.6223+00	.8769	[illegible]
12	.9597+01	.1989+01	.6441+03	.1627-14	.6441+03	.4674+03	.1447-15	.2235+00	.6386+00	.8754	[illegible]
13	.9818+01	.2081+01	.6551+03	.1561-14	.6551+03	.4694+03	.1365-15	.2435+00	.6505+00	.8740	.75[illegible]
14	.1005+02	.2161+01	.6625+03	.1497-14	.6625+03	.4710+03	.1295-15	.2635+00	.6585+00	.8726	.7475
15	.1028+02	.2233+01	.6666+03	.1437-14	.6666+03	.4724+03	.1235-15	.2837+00	.6629+00	.8718	.7446

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16	.1052+02	.2285+01	.6677+03	.1379-14	.6677+03	.4735+03	.1184-15	.3039+00	.6641+00	.8710	.7439
17	.1076+02	.2331+01	.6658+03	.1324-14	.6658+03	.4743+03	.1140-15	.3242+00	.6620+00	.8704	.7452
18	.1100+02	.2365+01	.6605+03	.1272-14	.6605+03	.4749+03	.1103-15	.3446+00	.6563+00	.8700	.7488
19	.1124+02	.2387+01	.6510+03	.1222-14	.6510+03	.4753+03	.1075-15	.3650+00	.6460+00	.8698	.7553
20	.1149+02	.2395+01	.6313+03	.1173-14	.6313+03	.4754+03	.1065-15	.3854+00	.6249+00	.8696	.7686
21	.1174+02	.2400+01	.6044+03	.1126-14	.6044+03	.4755+03	.1067-15	.4062+00	.5964+00	.8696	.7862
22	.1202+02	.2400+01	.5840+03	.1077-14	.5840+03	.4755+03	.1057-15	.4296+00	.5749+00	.8696	.7993
23	.1236+02	.2400+01	.5722+03	.1022-14	.5722+03	.4755+03	.1024-15	.4575+00	.5626+00	.8696	.8067
24	.1276+02	.2400+01	.5636+03	.9604-15	.5636+03	.4755+03	.9763-16	.4911+00	.5536+00	.8696	.8121
25	.1324+02	.2400+01	.5573+03	.8913-15	.5573+03	.4755+03	.9163-16	.5314+00	.5470+00	.8696	.8159
26	.1383+02	.2400+01	.5529+03	.8174-15	.5529+03	.4755+03	.8471-16	.5798+00	.5424+00	.8696	.8186
27	.1452+02	.2400+01	.5500+03	.7434-15	.5500+03	.4755+03	.7745-16	.6378+00	.5394+00	.8696	.8204
28	.1536+02	.2400+01	.5482+03	.6771-15	.5482+03	.4755+03	.7077-16	.7075+00	.5376+00	.8696	.8214
29	.1632+02	.2400+01	.5474+03	.6322-15	.5474+03	.4755+03	.6616-16	.7874+00	.5367+00	.8696	.8220
30	.1733+02	.2400+01	.5470+03	.6206-15	.5470+03	.4755+03	.6501-16	.8713+00	.5363+00	.8696	.8222
31	.1834+02	.2400+01	.5469+03	.6459-15	.5469+03	.4755+03	.6767-16	.9552+00	.5362+00	.8696	.8223
32	.1935+02	.2400+01	.5468+03	.7101-15	.5468+03	.4755+03	.7441-16	.1039+01	.5361+00	.8696	.8223
33	.2036+02	.2400+01	.5468+03	.8174-15	.5468+03	.4755+03	.8565-16	.1123+01	.5361+00	.8696	.8223
34	.2137+02	.2400+01	.5468+03	.9742-15	.5468+03	.4755+03	.1021-15	.1207+01	.5361+00	.8696	.8223
35	.2238+02	.2400+01	.5468+03	.1190-14	.5468+03	.4755+03	.1247-15	.1291+01	.5361+00	.8696	.8223
36	.2339+02	.2400+01	.5468+03	.1479-14	.5468+03	.4755+03	.1549-15	.1375+01	.5361+00	.8696	.8223
37	.2440+02	.2400+01	.5468+03	.1857-14	.5468+03	.4755+03	.1946-15	.1458+01	.5361+00	.8696	.8223
38	.2541+02	.2400+01	.5468+03	.2347-14	.5468+03	.4755+03	.2460-15	.1542+01	.5361+00	.8696	.8223
39	.2641+02	.2400+01	.5468+03	.2980-14	.5468+03	.4755+03	.3123-15	.1626+01	.5361+00	.8696	.8223
40	.2742+02	.2400+01	.5468+03	.3793-14	.5468+03	.4755+03	.3975-15	.1710+01	.5361+00	.8696	.8223
41	.2843+02	.2400+01	.5468+03	.4834-14	.5468+03	.4755+03	.5065-15	.1794+01	.5361+00	.8696	.8223
42	.2944+02	.2400+01	.5469+03	.6161-14	.5469+03	.4755+03	.6454-15	.1878+01	.5362+00	.8696	.8223
43	.3045+02	.2400+01	.5471+03	.7844-14	.5471+03	.4755+03	.8214-15	.1962+01	.5364+00	.8696	.8221
44	.3146+02	.2400+01	.5476+03	.9955-14	.5476+03	.4755+03	.1042-14	.2046+01	.5370+00	.8696	.8218
45	.3247+02	.2400+01	.5489+03	.1255-13	.5489+03	.4755+03	.1310-14	.2129+01	.5383+00	.8696	.8211
46	.3348+02	.2400+01	.5519+03	.1559-13	.5519+03	.4755+03	.1619-14	.2213+01	.5414+00	.8696	.8193
47	.3449+02	.2400+01	.5585+03	.1881-13	.5585+03	.4755+03	.1930-14	.2297+01	.5483+00	.8696	.8152
48	.3550+02	.2400+01	.5726+03	.2125-13	.5726+03	.4755+03	.2126-14	.2381+01	.5630+00	.8696	.8065

SHROUD
ON-BODY POINTS

I	X	Y	VP	VTHETA	VRES	VBARI	BETA	S	M	RB/RT	PSOPTC
49	.3550+02	.6000+01	-.5126+03	.1402-13	.5126+03	.4755+03	-.1568-14	.2987+01	.5008+00	.8696	.8426
50	.3449+02	.6000+01	-.5347+03	.1016-13	.5347+03	.4755+03	-.1089-14	.2903+01	.5236+00	.8696	.8296
51	.3348+02	.6000+01	-.5426+03	.7676-14	.5426+03	.4755+03	-.8105-15	.2819+01	.5317+00	.8696	.8245
52	.3247+02	.6000+01	-.5452+03	.5907-14	.5452+03	.4755+03	-.6208-15	.2735+01	.5344+00	.8696	.8233
53	.3146+02	.6000+01	-.5461+03	.4524-14	.5461+03	.4755+03	-.4810-15	.2652+01	.5354+00	.8696	.8227
54	.3045+02	.6000+01	-.5465+03	.3573-14	.5465+03	.4755+03	-.3746-15	.2568+01	.5358+00	.8696	.8225
55	.2944+02	.6000+01	-.5467+03	.2792-14	.5467+03	.4755+03	-.2926-15	.2484+01	.5360+00	.8696	.8224
56	.2843+02	.6000+01	-.5467+03	.2185-14	.5467+03	.4755+03	-.2290-15	.2400+01	.5360+00	.8696	.8224
57	.2742+02	.6000+01	-.5467+03	.1712-14	.5467+03	.4755+03	-.1794-15	.2316+01	.5360+00	.8696	.8224
58	.2641+02	.6000+01	-.5468+03	.1344-14	.5468+03	.4755+03	-.1409-15	.2232+01	.5361+00	.8696	.8224
59	.2541+02	.6000+01	-.5468+03	.1058-14	.5468+03	.4755+03	-.1109-15	.2148+01	.5361+00	.8696	.8224
60	.2440+02	.6000+01	-.5468+03	.8371-15	.5468+03	.4755+03	-.8772-16	.2064+01	.5361+00	.8696	.8224
61	.2339+02	.6000+01	-.5468+03	.6666-15	.5468+03	.4755+03	-.6985-16	.1981+01	.5361+00	.8696	.8224
62	.2239+02	.6000+01	-.5468+03	.5366-15	.5468+03	.4755+03	-.5623-16	.1897+01	.5361+00	.8696	.8224
63	.2137+02	.6000+01	-.5468+03	.4392-15	.5468+03	.4755+03	-.4602-16	.1813+01	.5361+00	.8696	.8224
64	.2036+02	.6000+01	-.5468+03	.3685-15	.5468+03	.4755+03	-.3861-16	.1729+01	.5361+00	.8696	.8224
65	.1935+02	.6000+01	-.5467+03	.3202-15	.5467+03	.4755+03	-.3355-16	.1645+01	.5360+00	.8696	.8224
66	.1834+02	.6000+01	-.5467+03	.2914-15	.5467+03	.4755+03	-.3054-16	.1561+01	.5360+00	.8696	.8224
67	.1733+02	.6000+01	-.5466+03	.2804-15	.5466+03	.4755+03	-.2939-16	.1477+01	.5359+00	.8696	.8225

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68	.1632+02	.6000+01	-.5463+03	.2866-15	.5463+03	.4755+03	-.3005-16	.1393+01	.5356+00	.8696	.8226
69	.1536+02	.6000+01	-.5458+03	.3092-15	.5458+03	.4755+03	-.3246-16	.1314+01	.5350+00	.8696	.8229
70	.1452+02	.6000+01	-.5447+03	.3435-15	.5447+03	.4755+03	-.3615-16	.1244+01	.5339+00	.8696	.8236
71	.1383+02	.6000+01	-.5429+03	.3847-15	.5429+03	.4755+03	-.4060-16	.1186+01	.5321+00	.8696	.8247
72	.1324+02	.6000+01	-.5404+03	.4297-15	.5404+03	.4755+03	-.4556-16	.1137+01	.5295+00	.8696	.8262
73	.1276+02	.6000+01	-.5370+03	.4768-15	.5370+03	.4755+03	-.5087-16	.1097+01	.5259+00	.8696	.8282
74	.1236+02	.6000+01	-.5327+03	.5253-15	.5327+03	.4755+03	-.5650-16	.1064+01	.5215+00	.8696	.8306
75	.1202+02	.6000+01	-.5275+03	.5754-15	.5275+03	.4755+03	-.6250-16	.1036+01	.5162+00	.8696	.833[illegible]
76	.1174+02	.6000+01	-.5201+03	.6313-15	.5201+03	.4755+03	-.6955-16	.1012+01	.5085+00	.8696	.83[illegible]
77	.1148+02	.5999+01	-.5115+03	.7032-15	.5115+03	.4754+03	-.7877-16	.9912+00	.4997+00	.8696	.8432
78	.1123+02	.5996+01	-.5057+03	.7536-15	.5057+03	.4753+03	-.8539-16	.9703+00	.4937+00	.8698	.8465
79	.1098+02	.5988+01	-.5033+03	.7828-15	.5033+03	.4749+03	-.8911-16	.9495+00	.4913+00	.8700	.8479
80	.1074+02	.5978+01	-.5022+03	.8033-15	.5022+03	.4743+03	-.9164-16	.9289+00	.4902+00	.8705	.8485
81	.1049+02	.5964+01	-.5021+03	.8182-15	.5021+03	.4734+03	-.9337-16	.9084+00	.4901+00	.8711	.8486
82	.1024+02	.5948+01	-.5026+03	.8298-15	.5026+03	.4722+03	-.9460-16	.8879+00	.4906+00	.8720	.8483
83	.9999+01	.5929+01	-.5037+03	.8395-15	.5037+03	.4707+03	-.9549-16	.8675+00	.4917+00	.8731	.8477
84	.9756+01	.5907+01	-.5052+03	.8483-15	.5052+03	.4689+03	-.9622-16	.8472+00	.4932+00	.8744	.8468
85	.9514+01	.5884+01	-.5070+03	.8573-15	.5070+03	.4666+03	-.9688-16	.8270+00	.4951+00	.8760	.8458
86	.9272+01	.5858+01	-.5092+03	.8674-15	.5092+03	.4640+03	-.9761-16	.8068+00	.4973+00	.8778	.8445
87	.9032+01	.5831+01	-.5116+03	.8794-15	.5116+03	.4609+03	-.9849-16	.7867+00	.4998+00	.8799	.8431
88	.8792+01	.5802+01	-.5143+03	.8939-15	.5143+03	.4574+03	-.9958-16	.7666+00	.5026+00	.8823	.8416
89	.8552+01	.5771+01	-.5172+03	.9115-15	.5172+03	.4535+03	-.1010-15	.7465+00	.5056+00	.8849	.8399
90	.8313+01	.5739+01	-.5205+03	.9329-15	.5205+03	.4491+03	-.1027-15	.7265+00	.5089+00	.8877	.8380
91	.8074+01	.5706+01	-.5240+03	.9587-15	.5240+03	.4442+03	-.1048-15	.7064+00	.5125+00	.8908	.8359
92	.7836+01	.5673+01	-.5297+03	.9933-15	.5297+03	.4468+03	-.1074-15	.6864+00	.5184+00	.8891	.8326
93	.7598+01	.5638+01	-.5366+03	.1036-14	.5366+03	.4523+03	-.1106-15	.6665+00	.5255+00	.8856	.8285
94	.7361+01	.5603+01	-.5441+03	.1085-14	.5441+03	.4581+03	-.1143-15	.6465+00	.5333+00	.8818	.8240
95	.7123+01	.5567+01	-.5523+03	.1144-14	.5523+03	.4640+03	-.1187-15	.6265+00	.5418+00	.8778	.8190
96	.6885+01	.5531+01	-.5611+03	.1212-14	.5611+03	.4700+03	-.1237-15	.6065+00	.5509+00	.8736	.8136
97	.6648+01	.5494+01	-.5705+03	.1291-14	.5705+03	.4763+03	-.1296-15	.5865+00	.5608+00	.8690	.8077
98	.6410+01	.5458+01	-.5807+03	.1382-14	.5807+03	.4826+03	-.1363-15	.5665+00	.5715+00	.8642	.8014
99	.6172+01	.5422+01	-.5916+03	.1486-14	.5916+03	.4891+03	-.1440-15	.5466+00	.5829+00	.8592	.7945
100	.5935+01	.5385+01	-.6032+03	.1607-14	.6032+03	.4956+03	-.1526-15	.5266+00	.5951+00	.8539	.7870
101	.5697+01	.5351+01	-.6154+03	.1745-14	.6154+03	.5021+03	-.1624-15	.5066+00	.6081+00	.8483	.7790
102	.5459+01	.5317+01	-.6284+03	.1902-14	.6284+03	.5087+03	-.1734-15	.4866+00	.6219+00	.8424	.7705
103	.5221+01	.5283+01	-.6421+03	.2082-14	.6421+03	.5152+03	-.1856-15	.4667+00	.6365+00	.8364	.7614
104	.4983+01	.5250+01	-.6563+03	.2287-14	.6563+03	.5217+03	-.1997-15	.4467+00	.6518+00	.8300	.7517
105	.4744+01	.5218+01	-.6712+03	.2521-14	.6712+03	.5280+03	-.2152-15	.4267+00	.6679+00	.8235	.7415
106	.4505+01	.5188+01	-.6867+03	.2787-14	.6867+03	.5342+03	-.2326-15	.4066+00	.6847+00	.8168	.7307
107	.4266+01	.5159+01	-.7027+03	.3090-14	.7027+03	.5402+03	-.2520-15	.3866+00	.7022+00	.8099	.7195
108	.4026+01	.5132+01	-.7191+03	.3434-14	.7191+03	.5460+03	-.2736-15	.3665+00	.7203+00	.8029	.7076
109	.3785+01	.5105+01	-.7358+03	.3825-14	.7358+03	.5514+03	-.2978-15	.3464+00	.7388+00	.7959	.6958
110	.3543+01	.5083+01	-.7527+03	.4268-14	.7527+03	.5565+03	-.3249-15	.3262+00	.7578+00	.7890	.6835
111	.3301+01	.5062+01	-.7698+03	.4771-14	.7696+03	.5612+03	-.3551-15	.3060+00	.7770+00	.7822	.6710
112	.3058+01	.5043+01	-.7867+03	.5340-14	.7867+03	.5654+03	-.3889-15	.2857+00	.7962+00	.7756	.6585
113	.2813+01	.5026+01	-.8036+03	.5985-14	.8036+03	.5691+03	-.4267-15	.2653+00	.8155+00	.7698	.6459
114	.2568+01	.5013+01	-.8203+03	.6714-14	.8203+03	.5721+03	-.4690-15	.2449+00	.8348+00	.7646	.6334
115	.2321+01	.5002+01	-.8372+03	.7540-14	.8372+03	.5745+03	-.5160-15	.2244+00	.8545+00	.7603	.6206
116	.2073+01	.4995+01	-.8556+03	.8480-14	.8556+03	.5762+03	-.5679-15	.2037+00	.8761+00	.7572	.6066
117	.1823+01	.4991+01	-.8864+03	.9581-14	.8864+03	.5771+03	-.6193-15	.1830+00	.9128+00	.7555	.5831
118	.1612+01	.4992+01	-.9229+03	.1067-13	.9229+03	.5769+03	-.6623-15	.1654+00	.9571+00	.7560	.5550
119	.1445+01	.5000+01	-.9362+03	.1156-13	.9362+03	.5750+03	-.7078-15	.1515+00	.9735+00	.7595	.5497
120	.1287+01	.5015+01	-.9264+03	.1239-13	.9264+03	.5714+03	-.7664-15	.1383+00	.9615+00	.7659	.5522
121	.1137+01	.5039+01	-.9047+03	.1317-13	.9047+03	.5663+03	-.8339-15	.1257+00	.9349+00	.7743	.5690
122	.9958+00	.5067+01	-.8742+03	.1389-13	.8742+03	.5600+03	-.9107-15	.1137+00	.8982+00	.7840	.5924
123	.8630+00	.5101+01	-.8367+03	.1458-13	.8367+03	.5526+03	-.9983-15	.1023+00	.8540+00	.7943	.6209
124	.7385+00	.5143+01	-.7931+03	.1522-13	.7931+03	.5443+03	-.1100-14	.9150-01	.8035+00	.8050	.6537

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125	.6222+00	.5183+01	-.7433+03	.1583-13	.7433+03	.5352+03	-.1220-14	.8118-01	.7472+00	.8157	.6904
126	.5142+00	.5231+01	-.6867+03	.1639-13	.6867+03	.5254+03	-.1368-14	.7134-01	.6848+00	.8262	.7307
127	.4154+00	.5284+01	-.6229+03	.1691-13	.6229+03	.5150+03	-.1555-14	.6205-01	.6150+00	.8365	.7741
128	.3262+00	.5340+01	-.5506+03	.1737-13	.5506+03	.5043+03	-.1808-14	.5329-01	.5400+00	.8464	.8200
129	.2463+00	.5400+01	-.4674+03	.1777-13	.4674+03	.4931+03	-.2178-14	.4498-01	.4546+00	.8559	.8678
130	.1761+00	.5463+01	-.3713+03	.1810-13	.3713+03	.4817+03	-.2793-14	.3710-01	.3585+00	.8650	.9150
131	.1177+00	.5529+01	-.2629+03	.1834-13	.2629+03	.4703+03	-.3977-14	.2977-01	.2523+00	.8734	.9567
132	.7108-01	.5597+01	-.1424+03	.1850-13	.1424+03	.4590+03	-.7443-14	.2296-01	.1360+00	.8812	.9872
133	.3566-01	.5667+01	-.8205+01	.1856-13	.8205+01	.4477+03	-.1296-12	.1694-01	.7823-02	.8886	1.0000
134	.1221-01	.5738+01	.1525+03	.2055-13	.1525+03	.5714+03	.7721-14	.1018-01	.1457+00	.7658	.9853
135	.1035-02	.5807+01	.3573+03	.2299-13	.3573+03	.5714+03	.3686-14	.4388-02	.3447+00	.7658	.9211
136	.2703-02	.5874+01	.6523+03	.2616-13	.6523+03	.5714+03	.2298-14	-.1215-02	.6475+00	.7658	.7544
137	.2326-01	.5937+01	.9682+03	.2952-13	.9682+03	.5714+03	.1747-14	-.6723-02	.1014+01	.7658	.5200
138	.5969-01	.5988+01	.1097+04	.3135-13	.1097+04	.5714+03	.1637-14	-.1190-01	.1184+01	.7658	.4211
139	.1022+00	.6027+01	.1126+04	.3227-13	.1126+04	.5714+03	.1642-14	-.1671-01	.1224+01	.7658	.3998
140	.1492+00	.6061+01	.1123+04	.3286-13	.1123+04	.5714+03	.1677-14	-.2150-01	.1219+01	.7658	.4020
141	.2038+00	.6092+01	.1109+04	.3333-13	.1109+04	.5714+03	.1722-14	-.2676-01	.1200+01	.7658	.4124
142	.2656+00	.6122+01	.1091+04	.3375-13	.1091+04	.5714+03	.1772-14	-.3247-01	.1175+01	.7658	.4259
143	.3342+00	.6151+01	.1073+04	.3413-13	.1073+04	.5714+03	.1823-14	-.3866-01	.1150+01	.7658	.4399
144	.4098+00	.6179+01	.1055+04	.3449-13	.1055+04	.5714+03	.1874-14	-.4535-01	.1126+01	.7658	.4535
145	.4926+00	.6205+01	.1038+04	.3485-13	.1038+04	.5714+03	.1923-14	-.5257-01	.1104+01	.7658	.4662
146	.5828+00	.6231+01	.1023+04	.3519-13	.1023+04	.5714+03	.1971-14	-.6037-01	.1084+01	.7658	.4779
147	.6808+00	.6256+01	.1009+04	.3554-13	.1009+04	.5714+03	.2018-14	-.6877-01	.1065+01	.7658	.4886
148	.7872+00	.6280+01	.9960+03	.3588-13	.9960+03	.5714+03	.2064-14	-.7784-01	.1049+01	.7658	.4985
149	.9024+00	.6303+01	.9843+03	.3623-13	.9843+03	.5714+03	.2109-14	-.8761-01	.1034+01	.7658	.5076
150	.1027+01	.6325+01	.9735+03	.3657-13	.9735+03	.5714+03	.2152-14	-.9819-01	.1020+01	.7658	.5159
151	.1162+01	.6347+01	.9635+03	.3692-13	.9635+03	.5714+03	.2195-14	-.1095+00	.1008+01	.7658	.5236
152	.1308+01	.6367+01	.9542+03	.3726-13	.9542+03	.5714+03	.2237-14	-.1217+00	.9959+00	.7658	.5308
153	.1465+01	.6386+01	.9454+03	.3761-13	.9454+03	.5714+03	.2279-14	-.1349+00	.9850+00	.7658	.5376
154	.1635+01	.6404+01	.9371+03	.3795-13	.9371+03	.5714+03	.2321-14	-.1491+00	.9746+00	.7658	.5440
155	.1818+01	.6420+01	.9289+03	.3830-13	.9289+03	.5714+03	.2362-14	-.1644+00	.9646+00	.7658	.5503
156	.2016+01	.6434+01	.9207+03	.3865-13	.9207+03	.5714+03	.2405-14	-.1809+00	.9544+00	.7658	.5567
157	.2230+01	.6445+01	.9118+03	.3900-13	.9118+03	.5714+03	.2450-14	-.1987+00	.9435+00	.7658	.5635
158	.2461+01	.6452+01	.8958+03	.3928-13	.8958+03	.5714+03	.2513-14	-.2179+00	.9241+00	.7658	.5759
159	.2710+01	.6453+01	.8678+03	.3945-13	.8678+03	.5714+03	.2605-14	-.2386+00	.8906+00	.7658	.5973
160	.2968+01	.6453+01	.8443+03	.3963-13	.8443+03	.5714+03	.2689-14	-.2600+00	.8629+00	.7658	.6152
161	.3226+01	.6453+01	.8314+03	.3988-13	.8314+03	.5714+03	.2748-14	-.2815+00	.8478+00	.7658	.6250
162	.3484+01	.6453+01	.8218+03	.4013-13	.8218+03	.5714+03	.2798-14	-.3029+00	.8366+00	.7658	.6322
163	.3742+01	.6453+01	.8142+03	.4037-13	.8142+03	.5714+03	.2841-14	-.3244+00	.8278+00	.7658	.6379
164	.4000+01	.6453+01	.8080+03	.4060-13	.8080+03	.5714+03	.2879-14	-.3458+00	.8206+00	.7658	.6426
165	.4258+01	.6453+01	.8029+03	.4082-13	.8029+03	.5714+03	.2913-14	-.3673+00	.8147+00	.7658	.6465
166	.4516+01	.6453+01	.7985+03	.4103-13	.7985+03	.5714+03	.2944-14	-.3887+00	.8096+00	.7658	.6498
167	.4774+01	.6453+01	.7947+03	.4122-13	.7947+03	.5714+03	.2972-14	-.4102+00	.8053+00	.7658	.6526
168	.5032+01	.6453+01	.7913+03	.4141-13	.7913+03	.5714+03	.2998-14	-.4316+00	.8015+00	.7658	.6551
169	.5290+01	.6453+01	.7[illegible]03	.4159-13	.7884+03	.5714+03	.3022-14	-.4531+00	.7981+00	.7658	.6572
170	.5548+01	.6453+01	.7858+03	.4175-13	.7858+03	.5714+03	.3044-14	-.4745+00	.7952+00	.7658	.6592
171	.5806+01	.6453+01	.7835+03	.4191-13	.7835+03	.5714+03	.3065-14	-.4959+00	.7925+00	.7658	.6609
172	.6064+01	.6453+01	.7814+03	.4206-13	.7814+03	.5714+03	.3084-14	-.5174+00	.7902+00	.7658	.6624
173	.6322+01	.6453+01	.7795+03	.4220-13	.7795+03	.5714+03	.3102-14	-.5388+00	.7880+00	.7658	.6638
174	.6580+01	.6453+01	.7778+03	.4234-13	.7778+03	.5714+03	.3119-14	-.5603+00	.7861+00	.7658	.6651
175	.6838+01	.6453+01	.7763+03	.4247-13	.7763+03	.5714+03	.3134-14	-.5817+00	.7843+00	.7658	.6662
176	.7096+01	.6453+01	.7748+03	.4259-13	.7748+03	.5714+03	.3149-14	-.6032+00	.7827+00	.7658	.6673
177	.7354+01	.6453+01	.7735+03	.4270-13	.7735+03	.5714+03	.3163-14	-.6246+00	.7812+00	.7658	.6683
178	.7612+01	.6453+01	.7723+03	.4281-13	.7723+03	.5714+03	.3176-14	-.6461+00	.7798+00	.7658	.6691
179	.7870+01	.6453+01	.7712+03	.4291-13	.7712+03	.5714+03	.3188-14	-.6675+00	.7786+00	.7658	.6700
180	.8128+01	.6453+01	.7702+03	.4301-13	.7702+03	.5714+03	.3200-14	-.6890+00	.7774+00	.7658	.6707
181	.8386+01	.6453+01	.7692+03	.4311-13	.7692+03	.5714+03	.3211-14	-.7104+00	.7763+00	.7658	.6714

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182	.8644+01	.6453+01	.7683+03	.4319-13	.7683+03	.5714+03	.3221-14	-.7317+00	.7753+00	.7658	.6721
183	.8902+01	.6453+01	.7675+03	.4328-13	.7675+03	.5714+03	.3231-14	-.7533+00	.7744+00	.7658	.6727
184	.9160+01	.6453+01	.7667+03	.4336-13	.7667+03	.5714+03	.3240-14	-.7747+00	.7735+00	.7658	.6733
185	.9418+01	.6453+01	.7660+03	.4344-13	.7660+03	.5714+03	.3249-14	-.7962+00	.7727+00	.7658	.6738
186	.9676+01	.6453+01	.7653+03	.4351-13	.7653+03	.5714+03	.3257-14	-.8176+00	.7719+00	.7658	.6743
187	.9934+01	.6453+01	.7647+03	.4358-13	.7647+03	.5714+03	.3265-14	-.8391+00	.7712+00	.7658	.6748
188	.1019+02	.6453+01	.7641+03	.4364-13	.7641+03	.5714+03	.3272-14	-.8605+00	.7705+00	.7658	.6752
189	.1045+02	.6453+01	.7635+03	.4370-13	.7635+03	.5714+03	.3280-14	-.8820+00	.7699+00	.7658	.6756
190	.1071+02	.6453+01	.7630+03	.4376-13	.7630+03	.5714+03	.3286-14	-.9034+00	.7693+00	.7658	.6760
191	.1097+02	.6453+01	.7625+03	.4382-13	.7625+03	.5714+03	.3293-14	-.9249+00	.7687+00	.7658	.6764
192	.1122+02	.6453+01	.7620+03	.4387-13	.7620+03	.5714+03	.3299-14	-.9463+00	.7682+00	.7658	.6768
193	.1148+02	.6453+01	.7615+03	.4392-13	.7615+03	.5714+03	.3304-14	-.9678+00	.7676+00	.7658	.6771
194	.1174+02	.6453+01	.7611+03	.4397-13	.7611+03	.5714+03	.3310-14	-.9892+00	.7672+00	.7658	.6774
195	.1202+02	.6453+01	.7608+03	.4402-13	.7608+03	.5714+03	.3315-14	-.1013+01	.7668+00	.7658	.6777
196	.1236+02	.6453+01	.7603+03	.4407-13	.7603+03	.5714+03	.3321-14	-.1041+01	.7662+00	.7658	.6780
197	.1277+02	.6453+01	.7597+03	.4413-13	.7597+03	.5714+03	.3328-14	-.1075+01	.7656+00	.7658	.6784
198	.1326+02	.6453+01	.7591+03	.4420-13	.7591+03	.5714+03	.3336-14	-.1116+01	.7650+00	.7658	.6788
199	.1385+02	.6453+01	.7585+03	.4426-13	.7585+03	.5714+03	.3344-14	-.1165+01	.7642+00	.7658	.6793
200	.1456+02	.6453+01	.7578+03	.4433-13	.7578+03	.5714+03	.3352-14	-.1223+01	.7635+00	.7658	.6798
201	.1541+02	.6453+01	.7571+03	.4439-13	.7571+03	.5714+03	.3359-14	-.1294+01	.7627+00	.7658	.6803
202	.1637+02	.6453+01	.7565+03	.4444-13	.7565+03	.5714+03	.3366-14	-.1374+01	.7619+00	.7658	.6808
203	.1738+02	.6453+01	.7559+03	.4446-13	.7559+03	.5714+03	.3370-14	-.1458+01	.7613+00	.7658	.6812
204	.1838+02	.6453+01	.7555+03	.4446-13	.7555+03	.5714+03	.3372-14	-.1542+01	.7608+00	.7658	.6815
205	.1939+02	.6453+01	.7551+03	.4444-13	.7551+03	.5714+03	.3372-14	-.1625+01	.7604+00	.7658	.6818
206	.2040+02	.6453+01	.7549+03	.4438-13	.7549+03	.5714+03	.3369-14	-.1709+01	.7602+00	.7658	.6820
207	.2140+02	.6453+01	.7547+03	.4430-13	.7547+03	.5714+03	.3363-14	-.1793+01	.7600+00	.7658	.6821
208	.2241+02	.6453+01	.7547+03	.4420-13	.7547+03	.5714+03	.3355-14	-.1876+01	.7600+00	.7658	.6821
209	.2342+02	.6453+01	.7547+03	.4406-13	.7547+03	.5714+03	.3344-14	-.1960+01	.7600+00	.7658	.6821
210	.2442+02	.6453+01	.7549+03	.4388-13	.7549+03	.5714+03	.3330-14	-.2044+01	.7602+00	.7658	.6819
211	.2543+02	.6453+01	.7552+03	.4366-13	.7552+03	.5714+03	.3312-14	-.2127+01	.7605+00	.7658	.6817
212	.2644+02	.6453+01	.7556+03	.4339-13	.7556+03	.5714+03	.3290-14	-.2211+01	.7610+00	.7658	.6814
213	.2744+02	.6453+01	.7562+03	.4306-13	.7562+03	.5714+03	.3262-14	-.2295+01	.7617+00	.7658	.6810
214	.2845+02	.6453+01	.7571+03	.4265-13	.7571+03	.5714+03	.3228-14	-.2378+01	.7626+00	.7658	.6804
215	.2946+02	.6453+01	.7582+03	.4216-13	.7582+03	.5714+03	.3186-14	-.2462+01	.7640+00	.7658	.6795
216	.3045+02	.6453+01	.7599+03	.4154-13	.7599+03	.5714+03	.3132-14	-.2546+01	.7659+00	.7658	.6783
217	.3147+02	.6453+01	.7624+03	.4077-13	.7624+03	.5714+03	.3064-14	-.2629+01	.7686+00	.7658	.6755
218	.3248+02	.6453+01	.7662+03	.3977-13	.7662+03	.5714+03	.2974-14	-.2713+01	.7729+00	.7658	.6737
219	.3348+02	.6453+01	.7728+03	.3845-13	.7728+03	.5714+03	.2851-14	-.2797+01	.7804+00	.7658	.6688
220	.3449+02	.6453+01	.7867+03	.3659-13	.7867+03	.5714+03	.2665-14	-.2880+01	.7962+00	.7658	.6585
221	.3550+02	.6453+01	.8209+03	.3359-13	.8209+03	.5714+03	.2344-14	-.2964+01	.8355+00	.7658	.6329

SOLUTION COMBINATION - COMBYN RELEASE 2-0 DATE 062377

OFF-BODY POINTS (RAKES)

	COORDINATES		*------------	-------------	---------	VELOCITIES	----------	--------------	------------*	PRESS.RATIO	
	AXIAL	RADIAL	AXIAL	RADIAL	CIRCUMFRNTL	RESULTANT	MERIDIONAL	CHORDWISE	SPANWISE	COMP	
I	X	Y	VX	VY	VZ	VRES	VM	VAFT	VSPAN	RHOBR	PSOPTC
	-5.0000-01	0.0000	5.9163+02	0.0000	0.0000	5.9163+02	0.0000	0.0000	0.0000		.7945
1	-5.0000-01	0.0000	5.9163+02	-5.1903-07	1.6498-14	5.9163+02	5.9163+02	5.1903-07	-1.5468-14	.9014	.7945
2	-5.0000-01	7.2222-01	5.9108+02	-2.6467+00	1.6536-14	5.9108+02	5.9108+02	2.6467+00	-1.6301-07	.9014	.7948
3	-5.0000-01	1.4444+00	5.8918+02	-5.7862+00	1.6648-14	5.8921+02	5.8921+02	5.7862+00	-3.5636-07	.9014	.7960
4	-5.0000-01	2.1667+00	5.8512+02	-9.9601+00	1.6849-14	5.8521+02	5.8521+02	9.9601+00	-6.1343-07	.9014	.7985
5	-5.0000-01	2.8889+00	5.7700+02	-1.5744+01	1.7166-14	5.7721+02	5.7721+02	1.5744+01	-9.6968-07	.9014	.8036
6	-5.0000-01	3.6111+00	5.6035+02	-2.3313+01	1.7643-14	5.6084+02	5.6084+02	2.3313+01	-1.4358-06	.9014	.8138
7	-5.0000-01	4.3333+00	5.2445+02	-2.9416+01	1.8368-14	5.2527+02	5.2527+02	2.9416+01	-1.8117-06	.9014	.8352
8	-5.0000-01	5.0556+00	4.4885+02	-8.4441+00	1.9520-14	4.4893+02	4.4893+02	8.4441+00	-5.2006-07	.9014	.8775
9	-5.0000-01	5.7778+00	4.1327+02	1.3327+02	2.1790-14	4.3422+02	4.3422+02	-1.3327+02	8.2082-06	.9014	.8851
10	-5.0000-01	6.5000+00	5.7650+02	1.7265+02	2.4225-14	6.0179+02	6.0179+02	-1.7265+02	1.0633-05	.9014	.7879
	-5.0000-01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		.0000
	0.0000	0.0000	5.9607+02	0.0000	0.0000	5.9607+02	0.0000	0.0000	0.0000		.7916
11	0.0000	0.0000	5.9607+02	-4.7963-07	1.5246-14	5.9607+02	5.9607+02	4.7963-07	-1.4294-14	.9014	.7916
12	0.0000	6.1111-01	5.9590+02	-2.6550+00	1.5267-14	5.9591+02	5.9591+02	2.6550+00	-1.6352-07	.9014	.7917
13	0.0000	1.2222+00	5.9531+02	-5.7610+00	1.5327-14	5.9534+02	5.9534+02	5.7610+00	-3.5481-07	.9014	.7921
14	0.0000	1.8333+00	5.9401+02	-9.8581+00	1.5435-14	5.9409+02	5.9409+02	9.8581+00	-6.0715-07	.9014	.7929
15	0.0000	2.4444+00	5.9137+02	-1.5707+01	1.5598-14	5.9158+02	5.9158+02	1.5707+01	-9.6737-07	.9014	.7945
16	0.0000	3.0556+00	5.8600+02	-2.4525+01	1.5835-14	5.8652+02	5.8652+02	2.4525+01	-1.5105-06	.9014	.7977
17	0.0000	3.6667+00	5.7466+02	-3.8451+01	1.6174-14	5.7595+02	5.7595+02	3.8451+01	-2.3681-06	.9014	.8044
18	0.0000	4.2778+00	5.4835+02	-6.1306+01	1.6672-14	5.5176+02	5.5176+02	6.1306+01	-3.7757-06	.9014	.8193
19	0.0000	4.8889+00	4.7610+02	-9.7428+01	1.7434-14	4.8596+02	4.8596+02	9.7428+01	-6.0005-06	.9014	.8576
20	0.0000	5.5000+00	2.0765+02	-8.7131+01	1.8558-14	2.2519+02	2.2519+02	8.7131+01	-5.3663-06	.9014	.9681
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		.0000
	5.0000-01	0.0000	6.3941+02	0.0000	0.0000	6.3941+02	0.0000	0.0000	-0.0000		.7631
21	5.0000-01	0.0000	6.3941+02	-4.6479-07	1.4774-14	6.3941+02	6.3941+02	4.6479-07	-1.3852-14	.8277	.7631
22	5.0000-01	5.6922-01	6.3954+02	-2.6647+00	1.4789-14	6.3955+02	6.3955+02	2.6647+00	-1.6412-07	.8277	.7630
23	5.0000-01	1.1384+00	6.3990+02	-5.7895+00	1.4819-14	6.3992+02	6.3992+02	5.7895+00	-3.5657-07	.8277	.7627
24	5.0000-01	1.7076+00	6.4041+02	-9.9269+00	1.4876-14	6.4049+02	6.4049+02	9.9269+00	-6.1138-07	.8277	.7624
25	5.0000-01	2.2759+00	6.4095+02	-1.5865+01	1.4961-14	6.4114+02	6.4114+02	1.5865+01	-9.7709-07	.8277	.7620
26	5.0000-01	2.8451+00	6.4124+02	-2.4906+01	1.5079-14	6.4172+02	6.4172+02	2.4906+01	-1.5340-06	.8277	.7616
27	5.0000-01	3.4153+00	6.4076+02	-3.9538+01	1.5240-14	6.4198+02	6.4198+02	3.9538+01	-2.4351-06	.8277	.7615
28	5.0000-01	3.9845+00	6.3832+02	-6.5299+01	1.5459-14	6.4166+02	6.4166+02	6.5299+01	-4.0217-06	.8277	.7616
29	5.0000-01	4.5537+00	6.3064+02	-1.1717+02	1.5770-14	6.4143+02	6.4143+02	1.1717+02	-7.2163-06	.8277	.7618
30	5.0000-01	5.1229+00	6.1097+02	-2.4960+02	1.6290-14	6.5999+02	6.5999+02	2.4960+02	-1.5372-05	.8277	.7492
	5.0000-01	5.2382+00	6.0886+02	-2.9971+02	1.6449-14	6.7863+02	6.7863+02	2.9971+02	-1.8459-05		.7364
	1.0000+00	0.0000	6.7044+02	0.0000	0.0000	6.7044+02	0.0000	0.0000	0.0000		.7420
31	1.0000+00	0.0000	6.7044+02	-4.3410-07	1.3798-14	6.7044+02	6.7044+02	4.3410-07	-1.2937-14	.7837	.7420
32	1.0000+00	5.4730-01	6.7087+02	-2.2465+00	1.3803-14	6.7088+02	6.7088+02	2.2465+00	-1.3836-07	.7837	.7417
33	1.0000+00	1.0946+00	6.7221+02	-4.9127+00	1.3810-14	6.7223+02	6.7223+02	4.9127+00	-3.0257-07	.7837	.7408
34	1.0000+00	1.6419+00	6.7455+02	-8.4890+00	1.3823-14	6.7461+02	6.7461+02	8.4890+00	-5.2282-07	.7837	.7391
35	1.0000+00	2.1892+00	6.7814+02	-1.3641+01	1.3840-14	6.7828+02	6.7828+02	1.3641+01	-8.4019-07	.7837	.7366
36	1.0000+00	2.7365+00	6.8349+02	-2.1398+01	1.3860-14	6.8382+02	6.8382+02	2.1398+01	-1.3179-06	.7837	.7327
37	1.0000+00	3.2838+00	6.9183+02	-3.3550+01	1.3878-14	6.9265+02	6.9265+02	3.3550+01	-2.0663-06	.7837	.7266
38	1.0000+00	3.8311+00	7.0635+02	-5.3616+01	1.3891-14	7.0839+02	7.0839+02	5.3616+01	-3.3021-06	.7837	.7155
39	1.0000+00	4.3784+00	7.3657+02	-8.9575+01	1.3890-14	7.4200+02	7.4200+02	8.9575+01	-5.5168-06	.7837	.6913
40	1.0000+00	4.9257+00	8.1541+02	-1.6262+02	1.3878-14	8.3147+02	8.3147+02	1.6262+02	-1.0016-05	.7837	.6249
	1.0000+00	5.0660+00	8.5360+02	-1.9339+02	1.3873-14	8.7524+02	8.7524+02	1.9339+02	-1.1911-05		.5916
	1.5000+00	0.0000	6.9123+02	0.0000	0.0000	6.9123+02	0.0000	0.0000	0.0000		.7276
41	1.5000+00	0.0000	6.9123+02	-3.9383-07	1.2518-14	6.9123+02	6.9123+02	3.9383-07	-1.1737-14	.7560	.7276
42	1.5000+00	5.3707-01	6.9196+02	-1.3861+00	1.2516-14	6.9196+02	6.9196+02	1.3861+00	-8.5369-08	.7560	.7271
43	1.5000+00	1.0741+00	6.9419+02	-3.1095+00	1.2499-14	6.9420+02	6.9420+02	3.1095+00	-1.9151-07	.7560	.7255

SOLUTION COMBINATION - COMBYN RELEASE 2-0 DATE 062377

44	1.5000+00	1.6112+00	6.9816+02	-5.5414+00	1.2472-14	6.9818+02	6.9818+02	5.5414+00	-3.4129-07	.7580	.7227
45	1.5000+00	2.1483+00	7.0430+02	-9.1318+00	1.2429-14	7.0436+02	7.0436+02	9.1318+00	-5.6242-07	.7580	.7183
46	1.5000+00	2.6854+00	7.1356+02	-1.4463+01	1.2362-14	7.1370+02	7.1370+02	1.4463+01	-8.9076-07	.7580	.7117
47	1.5000+00	3.2224+00	7.2781+02	-2.2294+01	1.2259-14	7.2815+02	7.2915+02	2.2294+01	-1.3731-06	.7580	.7013
48	1.5000+00	3.7595+00	7.5118+02	-3.3448+01	1.2101-14	7.5193+02	7.5193+02	3.3448+01	-2.0600-06	.7580	.6841
49	1.5000+00	4.2966+00	7.9353+02	-4.7697+01	1.1850-14	7.9496+02	7.9496+02	4.7697+01	-2.9376-06	.7580	.6524
50	1.5000+00	4.8336+00	8.8304+02	-5.6916+01	1.1432-14	8.8468+02	8.8468+02	5.6916+01	-3.5059-06	.7580	.5842
	1.5000+00	4.9958+00	9.3293+02	-5.3603+01	1.1270-14	9.3447+02	9.3447+02	5.3603+01	-3.3013-06		.5460
	1.6980+00	0.0000	6.9397+02	0.0000	0.0000	6.9397+02	0.0000	0.0000	0.0000		.7256
51	1.6980+00	0.0000	6.9397+02	-3.7478-07	1.1913-14	6.9397+02	6.9397+02	3.7478-07	-1.1169-14	.7556	.7256
52	1.6980+00	5.3550-01	6.9479+02	-9.2902-01	1.1907-14	6.9479+02	6.9479+02	9.2902-01	-5.7217-08	.7556	.7251
53	1.6980+00	1.0710+00	6.9732+02	-2.1543+00	1.1883-14	6.9732+02	6.9732+02	2.1543+00	-1.3268-07	.7556	.7233
54	1.6980+00	1.6065+00	7.0179+02	-3.9899+00	1.1841-14	7.0180+02	7.0180+02	3.9899+00	-2.4574-07	.7556	.7201
55	1.6980+00	2.1420+00	7.0870+02	-6.7886+00	1.1776-14	7.0873+02	7.0873+02	6.7886+00	-4.1810-07	.7556	.7152
56	1.6980+00	2.6775+00	7.1901+02	-1.0947+01	1.1678-14	7.1910+02	7.1910+02	1.0947+01	-6.7419-07	.7556	.7078
57	1.6980+00	3.2130+00	7.3460+02	-1.6839+01	1.1534-14	7.3479+02	7.3479+02	1.6839+01	-1.0371-06	.7556	.6966
58	1.6980+00	3.7485+00	7.5921+02	-2.4439+01	1.1320-14	7.5961+02	7.5961+02	2.4439+01	-1.5052-06	.7556	.6785
59	1.6980+00	4.2840+00	8.0059+02	-3.1515+01	1.0990-14	8.0121+02	8.0121+02	3.1515+01	-1.9410-06	.7556	.6477
60	1.6980+00	4.8195+00	8.7398+02	-2.3930+01	1.0454-14	8.7431+02	8.7431+02	2.3930+01	-1.4738-06	.7556	.5923
	1.6980+00	4.9907+00	9.1068+02	-9.1526+00	1.0219-14	9.1073+02	9.1073+02	9.1526+00	-5.6370-07		.5644
	2.6980+00	0.0000	6.8369+02	0.0000	0.0000	6.8369+02	0.0000	0.0000	0.0000		.7328
61	2.6980+00	0.0000	6.8369+02	-2.7682-07	8.7991-15	6.8369+02	6.8369+02	2.7682-07	-8.2499-15	.7673	.7326
62	2.6980+00	5.3049-01	6.8477+02	1.9994+00	8.7837-15	6.8478+02	6.8478+02	-1.9994+00	1.2314-07	.7673	.7321
63	2.6980+00	1.0610+00	6.8807+02	3.9021+00	8.7296-15	6.8808+02	6.8808+02	-3.9021+00	2.4033-07	.7673	.7296
64	2.6980+00	1.5915+00	6.9372+02	5.6557+00	8.6376-15	6.9374+02	6.9374+02	-5.6557+00	3.4833-07	.7673	.7258
65	2.6980+00	2.1220+00	7.0201+02	7.3033+00	8.5005-15	7.0205+02	7.0205+02	-7.3033+00	4.4980-07	.7673	.7199
66	2.6980+00	2.6524+00	7.1344+02	9.0690+00	8.3086-15	7.1349+02	7.1349+02	-9.0690+00	5.5855-07	.7673	.7118
67	2.6980+00	3.1829+00	7.2865+02	1.1505+01	8.0480-15	7.2874+02	7.2874+02	-1.1505+01	7.0855-07	.7673	.7009
68	2.6980+00	3.7134+00	7.4832+02	1.5726+01	7.6996-15	7.4849+02	7.4849+02	-1.5726+01	9.6857-07	.7673	.6865
69	2.6980+00	4.2439+00	7.7238+02	2.3596+01	7.2392-15	7.7274+02	7.7274+02	-2.3596+01	1.4533-06	.7673	.6688
70	2.6980+00	4.7744+00	7.9855+02	3.6943+01	6.6423-15	7.9940+02	7.9940+02	-3.6943+01	2.2753-06	.7673	.6490
	2.6980+00	5.0197+00	8.1018+02	4.4862+01	6.3166-15	8.1143+02	8.1143+02	-4.4862+01	2.7630-06		.6400
	3.6980+00	0.0000	6.5045+02	0.0000	0.0000	6.5045+02	0.0000	0.0000	0.0000		.7557
71	3.6980+00	0.0000	6.5045+02	-1.9479-07	6.1918-15	6.5045+02	6.5045+02	1.9479-07	-5.8053-15	.7934	.7557
72	3.6980+00	5.3948-01	6.5164+02	5.4007+00	6.1739-15	6.5166+02	6.5166+02	-5.4007+00	3.3262-07	.7934	.7549
73	3.6980+00	1.0790+00	6.5518+02	1.0723+01	6.1111-15	6.5527+02	6.5527+02	-1.0723+01	6.6045-07	.7934	.7524
74	3.6980+00	1.6184+00	6.6096+02	1.5971+01	6.0061-15	6.6116+02	6.6116+02	-1.5971+01	9.8362-07	.7934	.7484
75	3.6980+00	2.1579+00	6.6886+02	2.1287+01	5.8541-15	6.6920+02	6.6920+02	-2.1287+01	1.3111-06	.7934	.7429
76	3.6980+00	2.6974+00	6.7874+02	2.7001+01	5.6493-15	6.7928+02	6.7928+02	-2.7001+01	1.6630-06	.7934	.7359
77	3.6980+00	3.2369+00	6.9043+02	3.3634+01	5.3860-15	6.9125+02	6.9125+02	-3.3634+01	2.0715-06	.7934	.7276
78	3.6980+00	3.7763+00	7.0361+02	4.1858+01	5.0587-15	7.0486+02	7.0486+02	-4.1858+01	2.5780-06	.7934	.7180
79	3.6980+00	4.3158+00	7.1774+02	5.2364+01	4.6640-15	7.1964+02	7.1964+02	-5.2364+01	3.2250-06	.7934	.7074
80	3.6980+00	4.8553+00	7.3204+02	6.5651+01	4.2038-15	7.3497+02	7.3497+02	-6.5651+01	4.0434-06	.7934	.6964
	3.6980+00	5.0976+00	7.3633+02	7.2639+01	3.9779-15	7.4190+02	7.4190+02	-7.2639+01	4.4738-06		.6914
	1.1600+01	2.3992+00	6.1822+02	4.7135+00	1.1515-15	6.1824+02	6.1824+02	-4.7135+00	2.9030-07		.7772
81	1.1600+01	2.6458+00	6.0304+02	2.1175+01	1.0454-15	6.0342+02	6.0342+02	-2.1175+01	1.3042-06	.8696	.7869
82	1.1600+01	2.9935+00	5.8536+02	2.9186+01	9.3967-16	5.8609+02	5.8609+02	-2.9186+01	1.7976-06	.8696	.7980
83	1.1600+01	3.3351+00	5.7167+02	3.1038+01	8.6570-16	5.7252+02	5.7252+02	-3.1038+01	1.9116-06	.8696	.8065
84	1.1600+01	3.6798+00	5.6076+02	3.0279+01	8.1193-16	5.6156+02	5.6156+02	-3.0279+01	1.8649-06	.8696	.8133
85	1.1600+01	4.0245+00	5.5179+02	2.8254+01	7.7147-16	5.5251+02	5.5251+02	-2.8254+01	1.7401-06	.8696	.8189
86	1.1600+01	4.3691+00	5.4416+02	2.5519+01	7.4049-16	5.4475+02	5.4475+02	-2.5519+01	1.5717-06	.8696	.8236
87	1.1600+01	4.7138+00	5.3743+02	2.2270+01	7.1652-16	5.3789+02	5.3789+02	-2.2270+01	1.3716-06	.8696	.8277
88	1.1600+01	5.0585+00	5.3129+02	1.8485+01	6.9825-16	5.3161+02	5.3161+02	-1.8485+01	1.1384-06	.8696	.8314
89	1.1600+01	5.4031+00	5.2546+02	1.3931+01	6.8465-16	5.2565+02	5.2565+02	-1.3931+01	8.5801-07	.8696	.8349
90	1.1600+01	5.7478+00	5.1970+02	7.9568+00	6.7564-16	5.1976+02	5.1976+02	-7.9568+00	4.9005-07	.8696	.8384
	1.1600+01	6.0000+00	5.1505+02	1.5657+00	6.7333-16	5.1505+02	5.1505+02	-1.5657+00	9.6428-08		.8411

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	COORDINATES AXIAL	RADIAL		NEW CP	ANGLES MERIDIONAL	FLOW	UNDERTURNG	SPANWISE	SWIRL	
I	X	Y	VBRI	M	ALPHA	BETA	ETA	ZETA	PHI	OFRACT
	-5.0000-01	0.0000		5.8293-01	-5.0264-08	1.5977-15	0.0000	0.0000	0.0000	0.0000
1	-5.0000-01	0.0000	4.2634+02	5.8293-01	-5.0264-08	1.5977-15	5.0264-08	-1.4980-15	1.5977-15	0.0000
2	-5.0000-01	7.2222-01	4.2634+02	5.8235-01	-2.5655-01	1.6029-15	2.5655-01	-1.5801-08	1.6029-15	1.8213-02
3	-5.0000-01	1.4444+00	4.2634+02	5.8038-01	-5.6267-01	1.6189-15	5.6267-01	-3.4655-08	1.6189-15	7.2774-02
4	-5.0000-01	2.1667+00	4.2634+02	5.7618-01	-9.7521-01	1.6497-15	9.7521-01	-6.0068-08	1.6499-15	1.6339-01
5	-5.0000-01	2.8889+00	4.2634+02	5.6779-01	-1.5630+00	1.7039-15	1.5630+00	-9.6289-08	1.7045-15	2.8934-01
6	-5.0000-01	3.6111+00	4.2634+02	5.5069-01	-2.3823+00	1.8024-15	2.3823+00	-1.4661-07	1.8040-15	4.4882-01
7	-5.0000-01	4.3333+00	4.2634+02	5.1386-01	-3.2104+00	2.0035-15	3.2104+00	-1.9793-07	2.0067-15	6.3707-01
8	-5.0000-01	5.0556+00	4.2634+02	4.3608-01	-1.0778+00	2.4913-15	1.0778+00	-6.6386-08	2.4917-15	8.4143-01
9	-5.0000-01	5.7778+00	4.2634+02	4.2128-01	1.7874+01	2.8752-15	-1.7874+01	1.1380-06	3.0210-15	1.0554+00
10	-5.0000-01	6.5000+00	4.2634+02	5.9364-01	1.6672+01	2.3064-15	-1.6672+01	1.0568-06	2.4076-15	1.3243+00
	-5.0000-01	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.3243+00
	0.0000	0.0000		5.8760-01	-4.6103-08	1.4655-15	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	4.2634+02	5.8760-01	-4.6103-08	1.4655-15	4.6103-08	-1.3740-15	1.4655-15	0.0000
12	0.0000	6.1111-01	4.2634+02	5.8743-01	-2.5527-01	1.4679-15	2.5527-01	-1.5722-08	1.4679-15	1.3110-02
13	0.0000	1.2222+00	4.2634+02	5.8683-01	-5.5445-01	1.4751-15	5.5445-01	-3.4149-08	1.4752-15	5.2423-02
14	0.0000	1.8333+00	4.2634+02	5.8552-01	-9.5078-01	1.4886-15	9.5078-01	-5.8563-08	1.4888-15	1.1787-01
15	0.0000	2.4444+00	4.2634+02	5.8287-01	-1.5214+00	1.5107-15	1.5214+00	-9.3725-08	1.5113-15	2.0929-01
16	0.0000	3.0556+00	4.2634+02	5.7755-01	-2.3965+00	1.5469-15	2.3965+00	-1.4768-07	1.5482-15	3.2627-01
17	0.0000	3.6667+00	4.2634+02	5.6647-01	-3.8279+00	1.6090-15	3.8279+00	-2.3611-07	1.6126-15	4.6780-01
18	0.0000	4.2778+00	4.2634+02	5.4126-01	-6.3792+00	1.7313-15	6.3792+00	-3.9452-07	1.7421-15	6.3106-01
19	0.0000	4.8889+00	4.2634+02	4.7361-01	-1.1565+01	2.0555-15	1.1565+01	-7.2213-07	2.0981-15	8.0633-01
20	0.0000	5.5000+00	4.2634+02	2.1570-01	-2.2763+01	4.7218-15	2.2763+01	-1.4807-06	5.1206-15	9.4252-01
	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	9.4252-01
	5.0000-01	0.0000		6.3364-01	-4.1648-08	1.3239-15	0.0000	0.0000	0.0000	0.0000
21	5.0000-01	0.0000	5.2396+02	6.3364-01	-4.1648-08	1.3239-15	4.1648-08	-1.2412-15	1.3239-15	0.0000
22	5.0000-01	5.6922-01	5.2396+02	6.3378-01	-2.3873-01	1.3249-15	2.3873-01	-1.4703-08	1.3249-15	1.1950-02
23	5.0000-01	1.1384+00	5.2396+02	6.3418-01	-5.1837-01	1.3268-15	5.1837-01	-3.1927-08	1.3269-15	4.7808-02
24	5.0000-01	1.7076+00	5.2396+02	6.3479-01	-6.8806-01	1.3308-15	6.8806-01	-5.4699-08	1.3309-15	1.0759-01
25	5.0000-01	2.2769+00	5.2396+02	6.3549-01	-1.4179+00	1.3370-15	1.4179+00	-8.7345-08	1.3374-15	1.9133-01
26	5.0000-01	2.8461+00	5.2396+02	6.3611-01	-2.2243+00	1.3463-15	2.2243+00	-1.3706-07	1.3474-15	2.9901-01
27	5.0000-01	3.4153+00	5.2396+02	6.3638-01	-3.5309+00	1.3601-15	3.5309+00	-2.1774-07	1.3627-15	4.3057-01
28	5.0000-01	3.9845+00	5.2396+02	6.3604-01	-5.8408+00	1.3804-15	5.8408+00	-3.6098-07	1.3876-15	5.8568-01
29	5.0000-01	4.5537+00	5.2396+02	6.3580-01	-1.0525+01	1.4267-15	1.0525+01	-6.5562-07	1.4328-15	7.6322-01
30	5.0000-01	5.1229+00	5.2396+02	6.5575-01	-2.2221+01	1.4142-15	2.2221+01	-1.4416-06	1.5276-15	9.5879-01
	5.0000-01	5.2352+00		5.7594-01	-2.6209+01	1.3888-15	2.6209+01	-1.7370-06	1.5479-15	1.0000+00
	1.0000+00	0.0000		6.6705-01	-3.7098-08	1.1792-15	0.0000	0.0000	0.0000	0.0000
31	1.0000+00	0.0000	5.6022+02	6.6705-01	-3.7098-08	1.1792-15	3.7098-08	-1.1056-15	1.1792-15	0.0000
32	1.0000+00	5.4730-01	5.6022+02	6.6752-01	-1.9186-01	1.1788-15	1.9186-01	-1.1817-08	1.1788-15	1.1342-02
33	1.0000+00	1.0946+00	5.6022+02	6.6899-01	-4.1873-01	1.1771-15	4.1873-01	-2.5789-08	1.1771-15	4.5394-02
34	1.0000+00	1.6419+00	5.6022+02	6.7157-01	-7.2100-01	1.1740-15	7.2100-01	-4.4402-08	1.1741-15	1.0223-01
35	1.0000+00	2.1892+00	5.6022+02	6.7555-01	-1.1524+00	1.1691-15	1.1524+00	-7.0983-08	1.1693-15	1.8199-01
36	1.0000+00	2.7365+00	5.6022+02	6.8159-01	-1.7932+00	1.1613-15	1.7932+00	-1.1048-07	1.1618-15	2.8491-01
37	1.0000+00	3.2838+00	5.6022+02	6.9122-01	-2.7763+00	1.1480-15	2.7763+00	-1.7113-07	1.1494-15	4.1134-01
38	1.0000+00	3.8311+00	5.6022+02	7.0848-01	-4.3407+00	1.1235-15	4.3407+00	-2.6785-07	1.1267-15	5.6196-01
39	1.0000+00	4.3784+00	5.6022+02	7.4575-01	-6.9337+00	1.0726-15	6.9337+00	-4.2913-07	1.0805-15	7.3817-01
40	1.0000+00	4.9257+00	5.6022+02	6.4781-01	-1.1279+01	9.5626-16	1.1279+01	-7.0377-07	9.7512-16	9.4270-01
	1.0000+00	5.0650+00		8.9945-01	-1.2766+01	9.0817-16	1.2766+01	-7.9949-07	9.3119-16	1.0000+00
	1.5000+00	0.0000		6.8967-01	-3.2644-08	1.0376-15	0.0000	0.0000	0.0000	0.0000
41	1.5000+00	0.0000	5.7578+02	6.8967-01	-3.2644-08	1.0376-15	3.2644-08	-9.7286-16	1.0376-15	0.0000
42	1.5000+00	5.3707-01	5.7578+02	6.9047-01	-1.1477-01	1.0364-15	1.1477-01	-7.0688-09	1.0364-15	1.1110-02
43	1.5000+00	1.0741+00	5.7578+02	6.9292-01	-2.5664-01	1.0316-15	2.5664-01	-1.5806-08	1.0316-15	4.4475-02

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44	1.5000+00	1.6112+00	5.7578+02	5.9727-01	-4.5476-01	1.0235-15	4.5476-01	-2.8008-08	1.0235-15	1.0021-01
45	1.5000+00	2.1483+00	5.7578+02	7.0406-01	-7.4284-01	1.0110-15	7.4284-01	-4.5753-08	1.0111-15	1.7864-01
46	1.5000+00	2.6854+00	5.7578+02	7.1434-01	-1.1612+00	9.9238-16	1.1612+00	-7.1525-08	9.9259-16	2.7979-01
47	1.5000+00	3.2224+00	5.7578+02	7.3032-01	-1.7546+00	9.6465-16	1.7546+00	-1.0809-07	9.6510-16	4.0454-01
48	1.5000+00	3.7595+00	5.7578+02	7.5586-01	-2.5496+00	9.2210-16	2.5496+00	-1.5713-07	9.2301-16	5.5370-01
49	1.5000+00	4.2966+00	5.7578+02	8.0562-01	-3.4398+00	8.5807-16	3.4398+00	-2.1211-07	8.5561-16	7.2886-01
50	1.5000+00	4.8336+00	5.7578+02	9.1099-01	-3.6879+00	7.4059-16	3.6879+00	-2.2745-07	7.4213-16	9.3233-01
	1.5000+00	4.9968+00		9.7138-01	-3.2884+00	6.9100-16	3.2884+00	-2.0275-07	6.9219-16	1.0000+00
	1.6980+00	0.0000		5.9266-01	-3.0943-08	9.8356-16	0.0000	0.0000	0.0000	0.0000
51	1.6980+00	0.0000	5.7710+02	6.9266-01	-3.0943-08	9.8356-16	3.0943-08	-9.2217-16	9.8356-16	0.0000
52	1.6980+00	5.3550-01	5.7710+02	6.9356-01	-7.5611-02	9.8191-16	7.6611-02	-4.7184-09	9.8191-16	1.1060-02
53	1.6980+00	1.0710+00	5.7710+02	6.9633-01	-1.7701-01	9.7633-16	1.7701-01	-1.0902-08	9.7634-16	4.4262-02
54	1.6980+00	1.6065+00	5.7710+02	7.0125-01	-3.2574-01	9.6670-16	3.2574-01	-2.0062-08	9.6572-16	9.9794-02
55	1.6980+00	2.1420+00	5.7710+02	7.0887-01	-5.4882-01	9.5197-16	5.4882-01	-3.3802-08	9.5201-16	1.7783-01
56	1.6980+00	2.6775+00	5.7710+02	7.2030-01	-8.7223-01	9.3049-16	8.7223-01	-5.3724-08	9.3060-16	2.7877-01
57	1.6980+00	3.2130+00	5.7710+02	7.3771-01	-1.3132+00	8.9940-16	1.3132+00	-8.0891-08	8.9964-16	4.0321-01
58	1.6980+00	3.7485+00	5.7710+02	7.6549-01	-1.8437+00	8.5381-16	1.8437+00	-1.1359-07	8.5426-16	5.5207-01
59	1.6980+00	4.2840+00	5.7710+02	8.1279-01	-2.2543+00	7.8589-16	2.2543+00	-1.3891-07	7.8649-16	7.2681-01
60	1.6980+00	4.8195+00	5.7710+02	8.9835-01	-1.5684+00	6.8510-16	1.5684+00	-9.6620-08	6.8535-16	9.2924-01
	1.6980+00	4.9907+00		9.4225-01	-5.7582-01	6.4288-16	5.7582-01	-3.5465-08	6.4291-16	1.0000+00
	2.6980+00	0.0000		6.8144-01	-2.3198-08	7.3740-16	0.0000	0.0000	0.0000	0.0000
61	2.6980+00	0.0000	5.7060+02	6.8144-01	-2.3198-08	7.3740-16	2.3198-08	-6.9137-16	7.3740-16	0.0000
62	2.6980+00	5.3049-01	5.7060+02	6.8253-01	1.6729-01	7.3494-16	-1.6729-01	1.0303-08	7.3494-16	1.0745-02
63	2.6980+00	1.0610+00	5.7060+02	6.8623-01	3.2493-01	7.2691-16	-3.2493-01	2.0012-08	7.2692-16	4.3034-02
64	2.6980+00	1.5915+00	5.7060+02	6.9241-01	4.6711-01	7.1338-16	-4.6711-01	2.8769-08	7.1340-16	9.7035-02
65	2.6980+00	2.1220+00	5.7060+02	7.0152-01	5.9605-01	6.9374-16	-5.9605-01	3.6711-08	6.9378-16	1.7303-01
66	2.6980+00	2.6524+00	5.7060+02	7.1911-01	7.2829-01	6.6720-16	-7.2829-01	4.4857-08	6.6726-16	2.7143-01
67	2.6980+00	3.1829+00	5.7060+02	7.3098-01	9.0456-01	6.3276-16	-9.0456-01	5.5715-08	6.3284-16	3.9280-01
68	2.6980+00	3.7134+00	5.7060+02	7.5300-01	1.2039+00	5.8939-16	-1.2039+00	7.4159-08	5.8952-16	5.3781-01
69	2.6980+00	4.2439+00	5.7060+02	7.8033-01	1.7498+00	5.3676-16	-1.7498+00	1.0780-07	5.3701-16	7.0723-01
70	2.6980+00	4.7744+00	5.7060+02	8.1072-01	2.6487+00	4.7606-16	-2.6487+00	1.6325-07	4.7659-16	9.0161-01
	2.6980+00	5.0197+00		8.2455-02	3.1694+00	4.4603-16	-3.1694+00	1.9540-07	4.4671-16	1.0000+00
	3.6980+00	0.0000		6.4547-01	-1.7159-08	5.4541-16	0.0000	0.0000	0.0000	0.0000
71	3.6980+00	0.0000	5.5329+02	6.4547-01	-1.7159-08	5.4541-16	1.7159-08	-5.1137-16	5.4541-16	0.0000
72	3.6980+00	5.3948-01	5.5329+02	6.4678-01	4.7485-01	5.4283-16	-4.7485-01	2.9246-08	5.4285-16	1.0805-02
73	3.6980+00	1.0790+00	5.5329+02	6.5066-01	9.3769-01	5.3434-16	-9.3769-01	5.7756-08	5.3441-16	4.3286-02
74	3.6980+00	1.6184+00	5.5329+02	6.5701-01	1.3842+00	5.2049-16	-1.3842+00	8.5265-08	5.2064-16	9.7640-02
75	3.6980+00	2.1579+00	5.5329+02	6.6571-01	1.8229+00	5.0122-16	-1.8229+00	1.1231-07	5.0147-16	1.7417-01
76	3.6980+00	2.6974+00	5.5329+02	6.7664-01	2.2781+00	4.7651-16	-2.2781+00	1.4038-07	4.7688-16	2.7329-01
77	3.6980+00	3.2369+00	5.5329+02	6.8969-01	2.7889+00	4.4643-16	-2.7889+00	1.7190-07	4.4696-16	3.9545-01
78	3.6980+00	3.7763+00	5.5329+02	7.0460-01	3.4045+00	4.1121-16	-3.4045+00	2.0993-07	4.1193-16	5.4115-01
79	3.6980+00	4.3158+00	5.5329+02	7.2090-01	4.1727+00	3.7133-16	-4.1727+00	2.5745-07	3.7232-16	7.1084-01
80	3.6980+00	4.8553+00	5.5329+02	7.3791-01	5.1247+00	3.2771-16	-5.1247+00	3.1647-07	3.2903-16	9.0487-01
	3.6980+00	5.0976+00		7.4563-01	5.6189+00	3.0721-16	-5.6189+00	3.4717-07	3.0869-16	1.0000+00
	1.1600+01	2.3992+00		6.1106-01	4.3683-01	1.0672-16	-4.3683-01	2.6904-08	1.0672-16	0.0000
81	1.1600+01	2.6458+00	4.7545+02	5.9535-01	2.0111+00	9.9263-17	-2.0111+00	1.2391-07	9.9324-17	4.4343-02
82	1.1600+01	2.9905+00	4.7545+02	5.7710-01	2.8544+00	9.1861-17	-2.8544+00	1.7595-07	9.1975-17	1.1234-01
83	1.1600+01	3.3351+00	4.7545+02	5.6298-01	3.1077+00	8.6637-17	-3.1077+00	1.9159-07	8.6765-17	1.8731-01
84	1.1600+01	3.6798+00	4.7545+02	5.5147-01	3.0908+00	8.2837-17	-3.0908+00	1.9054-07	8.2958-17	2.6925-01
85	1.1600+01	4.0245+00	4.7545+02	5.4203-01	2.9312+00	8.0002-17	-2.9312+00	1.8069-07	8.0107-17	3.5815-01
86	1.1600+01	4.3691+00	4.7545+02	5.3399-01	2.6851+00	7.7882-17	-2.6851+00	1.6549-07	7.7968-17	4.5400-01
87	1.1600+01	4.7138+00	4.7545+02	5.2688-01	2.3729+00	7.6323-17	-2.3729+00	1.4623-07	7.6388-17	5.5675-01
88	1.1600+01	5.0585+00	4.7545+02	5.2039-01	1.9926+00	7.5257-17	-1.9926+00	1.2277-07	7.5302-17	6.6635-01
89	1.1600+01	5.4031+00	4.7545+02	5.1425-01	1.5187+00	7.4627-17	-1.5187+00	9.3556-08	7.4653-17	7.8274-01
90	1.1600+01	5.7478+00	4.7545+02	5.0819-01	8.7715-01	7.4478-17	-8.7715-01	5.4027-08	7.4487-17	9.0581-01
	1.1600+01	6.0000+00		5.0335-01	1.7417-01	7.4902-17	-1.7417-01	1.0727-08	7.4903-17	1.0000+00

RELATIVE ROTOR INLET DATA

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X = 11.6000 UTIP = .0000

Y	U	VZPRIME	VPRIM	MPRIME	BETAPR	VZPRST	VPRST	MPRS	BETAPS
2.3992+00	0.0000	1.1515-15	6.1824+02	6.1106-01	1.0672-16	-1.1515-15	6.1824+02	6.1106-01	-1.0672-16
2.6458+00	0.0000	1.0454-15	6.0342+02	5.9535-01	9.9263-17	-1.0454-15	6.0342+02	5.9535-01	-9.9263-17
2.9905+00	0.0000	9.3967-16	5.8609+02	5.7710-01	9.1861-17	-9.3967-16	5.8609+02	5.7710-01	-9.1861-17
3.3351+00	0.0000	8.6570-16	5.7252+02	5.6288-01	8.6637-17	-8.6570-16	5.7252+02	5.6288-01	-8.6637-17
3.6798+00	0.0000	8.1193-16	5.6158+02	5.5147-01	8.2837-17	-8.1193-16	5.6158+02	5.5147-01	-8.2837-17
4.0245+00	0.0000	7.7147-16	5.5251+02	5.4203-01	8.0002-17	-7.7147-16	5.5251+02	5.4203-01	-8.0002-17
4.3691+00	0.0000	7.4049-16	5.4475+02	5.3399-01	7.7882-17	-7.4049-16	5.4475+02	5.3399-01	-7.7882-17
4.7138+00	0.0000	7.1652-16	5.3789+02	5.2688-01	7.6323-17	-7.1652-16	5.3789+02	5.2688-01	-7.6323-17
5.0585+00	0.0000	6.9825-16	5.3161+02	5.2039-01	7.5257-17	-6.9825-16	5.3161+02	5.2039-01	-7.5257-17
5.4031+00	0.0000	6.8465-16	5.2565+02	5.1425-01	7.4627-17	-6.8465-16	5.2565+02	5.1425-01	-7.4627-17
5.7478+00	0.0000	6.7564-16	5.1976+02	5.0819-01	7.4478-17	-6.7564-16	5.1976+02	5.0819-01	-7.4478-17
6.0000+00	0.0000	6.7333-16	5.1505+02	5.0335-01	7.4902-17	-6.7333-16	5.1505+02	5.0335-01	-7.4902-17

RAKE WEIGHT FLOW DATA

I	X	(Q(I)-QBAR)/QBAR	QS TOT	QFR	QSTOTCR/ARAKE	MBAR	QWALL	QSTOT/QWALL
1	-5.0000-01	3.2425-01	1.5534+01	1.0000+00				
2	0.0000	-5.7424-02	1.1056+01	1.0000+00				
3	5.0000-01	-5.0493-03	1.1672+01	1.0000+00	4.2410+01	6.2048-01	1.0963+01	1.0646+00
4	1.0000+00	-3.7901-03	1.1686+01	1.0000+00	4.5399+01	7.0838-01	1.2295+01	9.5047-01
5	1.5000+00	-4.0969-03	1.1683+01	1.0000+00	4.6651+01	7.5580-01	1.2346+01	9.4629-01
6	1.6980+00	-3.3770-03	1.1691+01	1.0000+00	4.6800+01	7.6215-01	1.2308+01	9.4986-01
7	2.6980+00	-9.2453-04	1.1720+01	1.0000+00	4.6373+01	7.4445-01	1.2120+01	9.6701-01
8	3.6980+00	-5.8740-04	1.1724+01	1.0000+00	4.4982+01	6.9440-01	1.2036+01	9.7405-01
9	1.1600+01	0.0000	1.1731+01	1.0000+00	3.8671+01	5.3533-01	1.1241+01	1.0436+00

STREAMLINES

X = -.500

QSTRM	YSTRM
1.00000-01	1.66143+00
2.00000-01	2.37658+00
3.00000-01	2.93716+00
4.00000-01	3.39004+00
5.00000-01	3.80748+00
6.00000-01	4.19112+00
7.00000-01	4.55573+00
8.00000-01	4.90713+00
9.00000-01	5.25328+00
1.00000+00	5.59089+00

X = .000

QSTRM	YSTRM
1.00000-01	1.65646+00
2.00000-01	2.38234+00
3.00000-01	2.91832+00
4.00000-01	3.37391+00
5.00000-01	3.78719+00
6.00000-01	4.16150+00
7.00000-01	4.51815+00
8.00000-01	4.86683+00
9.00000-01	5.30922+00

X = .500

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QSTRM	YSTRM
1.00000-01	1.63534+00
2.00000-01	2.32269+00
3.00000-01	2.85034+00
4.00000-01	3.28303+00
5.00000-01	3.67009+00
6.00000-01	4.03043+00
7.00000-01	4.35104+00
8.00000-01	4.65078+00
9.00000-01	4.95184+00
1.00000+00	5.23823+00

X = 1.000

QSTRM	YSTRM
1.00000-01	1.62041+00
2.00000-01	2.29495+00
3.00000-01	2.80183+00
4.00000-01	3.23472+00
5.00000-01	3.60595+00
6.00000-01	3.94924+00
7.00000-01	4.25983+00
8.00000-01	4.54383+00
9.00000-01	4.81143+00
1.00000+00	5.05604+00

X = 1.500

QSTRM	YSTRM
1.00000-01	1.60915+00
2.00000-01	2.25212+00
3.00000-01	2.77235+00
4.00000-01	3.20289+00
5.00000-01	3.56615+00
6.00000-01	3.90147+00
7.00000-01	4.20810+00
8.00000-01	4.48436+00
9.00000-01	4.74832+00
1.00000+00	4.99684+00

X = 1.598

QSTRM	YSTRM
1.00000-01	1.60790+00
2.00000-01	2.25959+00
3.00000-01	2.75884+00
4.00000-01	3.19919+00
5.00000-01	3.55118+00
6.00000-01	3.89538+00
7.00000-01	4.20183+00
8.00000-01	4.47760+00
9.00000-01	4.74219+00
1.00000+00	4.99068+00

X = 2.698

QSTRM	YSTRM
1.00000-01	1.61216+00
2.00000-01	2.25735+00
3.00000-01	2.77731+00
4.00000-01	3.20928+00

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5.00000-01	3.57509+00
6.00000-01	3.93814+00
7.00000-01	4.22127+00
8.00000-01	4.49710+00
9.00000-01	4.77001+00
1.00000+00	5.01972+00

X = 3.698

QSTRM	YSTRM
1.00000-01	1.63506+00
2.00000-01	2.29847+00
3.00000-01	2.81534+00
4.00000-01	3.25370+00
5.00000-01	3.62397+00
6.00000-01	3.96343+00
7.00000-01	4.28135+00
8.00000-01	4.56372+00
9.00000-01	4.84176+00
1.00000+00	5.09763+00

X = 11.600

QSTRM	YSTRM
1.00000-01	2.92792+00
2.00000-01	3.38851+00
3.00000-01	3.79901+00
4.00000-01	4.17496+00
5.00000-01	4.52346+00
6.00000-01	4.84982+00
7.00000-01	5.15811+00
8.00000-01	5.45147+00
9.00000-01	5.73153+00
1.00000+00	6.03004+00

SOLUTION COMBINATION - COMBYN RELEASE 2-0 DATE 062377

CASE -- BFUC1

YTESTH = 2.40000+00 YTESTS = 6.00000+00 YWING = 6.45000+00

VC = 5.45791+02 VINF = 7.46140+02 ALFAF = -1.57080+00 TTOTAL = 4.58180+02

RHOT = 8.90685-04 PA = 6.66421+02 PAC = 6.29415+02

MINF = 7.50375-01 MC = 5.36045-01

NTHETA = 2

SURFACE INTEGRALS

	**********HUB**********			*********SHROUD*********			TOTAL (HUB AND SHROUD)		
	COMPRESS	INCOMPRESS	AREA	COMPRESS	INCOMPRESS	AREA	COMPRESS	INCOMPRESS	AREA
TOTAL FORCE	-3.0671+01	-1.7666+01	3.5144-01	-1.0654+02	2.6799+01	3.6032+00	-1.3721+02	9.1330+00	3.9546+00
LIFT									
FORCE	-1.4883+01	-1.0233+01	1.2566-01	2.2279+01	2.6802+01	1.2223-01	7.3959+00	1.6569+01	2.4789-01
MOMENT	0.0000	0.0000		3.9636-07	3.9636-07		3.9636-07	3.9636-07	
MOM.ARM	0.0000	0.0000		2.1349-07	1.7746-07		6.4309-07	2.8705-07	
DRAG									
FORCE	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	
MOMENT	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	
MOM.ARM	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	

RESULTANTS ANGLE OF ATTACK = -9.00000+01 FOR LIFT AND DRAG

	HUB COMPRESS	HUB INCOMPRESS	SHROUD COMPRESS	SHROUD INCOMPRESS	TOTAL COMPRESS	TOTAL INCOMPRESS
MOMENT	0.0000	0.0000	3.9636-07	3.9636-07	3.9636-07	3.9636-07
LIFT	-2.3654-07	-1.6264-07	3.5409-07	4.2598-07	1.1755-07	2.6334-07
DRAG	1.4883+01	1.0233+01	-2.2279+01	-2.6802+01	-7.3959+00	-1.6569+01
FORCE	1.4883+01	1.0233+01	2.2279+01	2.6802+01	7.3959+00	1.6569+01

MEASURING STATION INTEGRALS X = 1.16000+01

	AREA		FORCE DUE TO PRESS.	WEIGHT FLOW	MOMENTUM FLUX	MOMENT OF MOMENTUM FLX	DRAG FLUX	AVERAGE VAFT
INT	6.59827-01	INCOMP	-5.6074+01	1.0344+01	1.7621+02	0.0000	0.00000	0.0000
EXACT	6.59827-01	COMP	-8.0491+01	1.1731+01	1.9971+02	0.0000	0.00000	0.0000

VINF/VC = 1.3647+00 (VINF-VAFTAV)/VC = 1.3647+00 (VINF-VAFTAC)/VC = 1.3647+00

D/L = -6.2920+07 DC/LC = -6.2920+07

MISALIGNMENT PARAMETERS

DELV = 0.00000 DELVC = 0.00000 DELM = 0.00000 DELMC = 0.00000

COMPARISONS

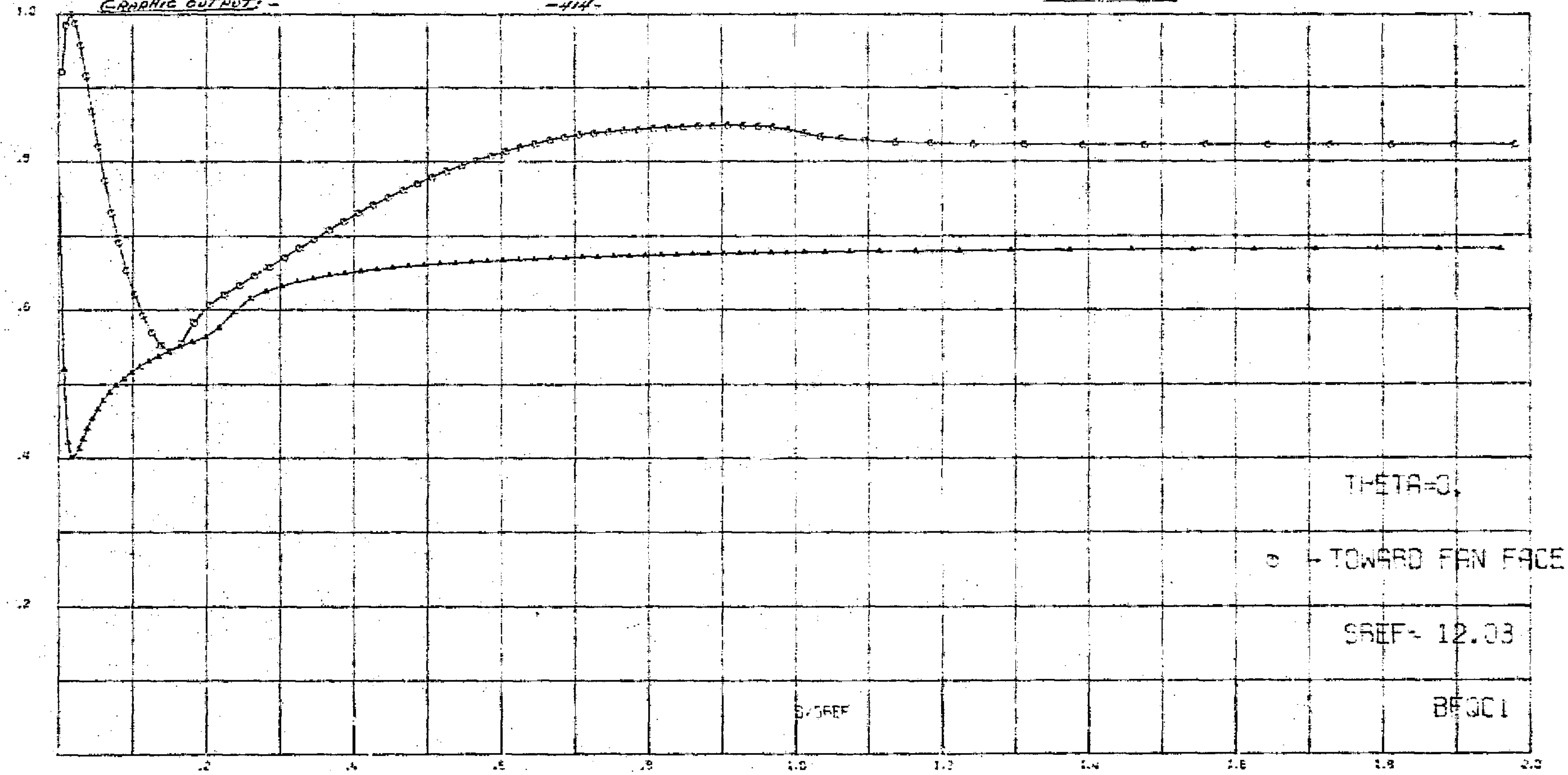
MFLXP = -3.95044+01 DMFLX = 2.15715+02 PCDMF = 1.22419+00 PCD2L = 1.00000+00

MFLXPC = -7.30953+01 DMFLXC = 2.72803+02 PCDMFC = 1.36601+00 PCD2LC = 1.00000+00

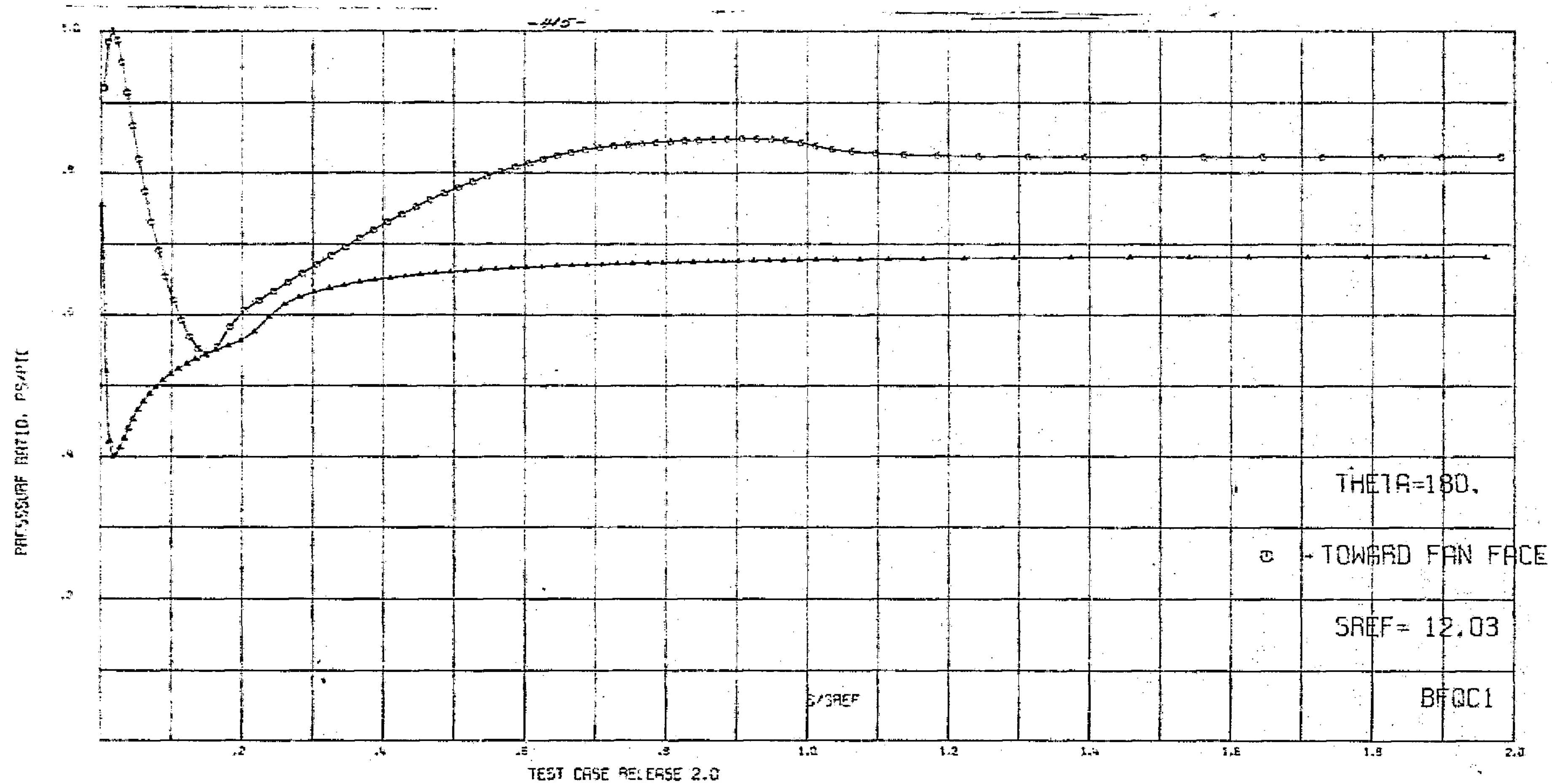
LIFT = 3.6848-06 LIFTC = 4.4475-06 DRAGP = 8.0306+00 DRAGPC = -7.7897+00 DRAG = 8.0306+00 DRAGC = -7.7897+00

@FIN

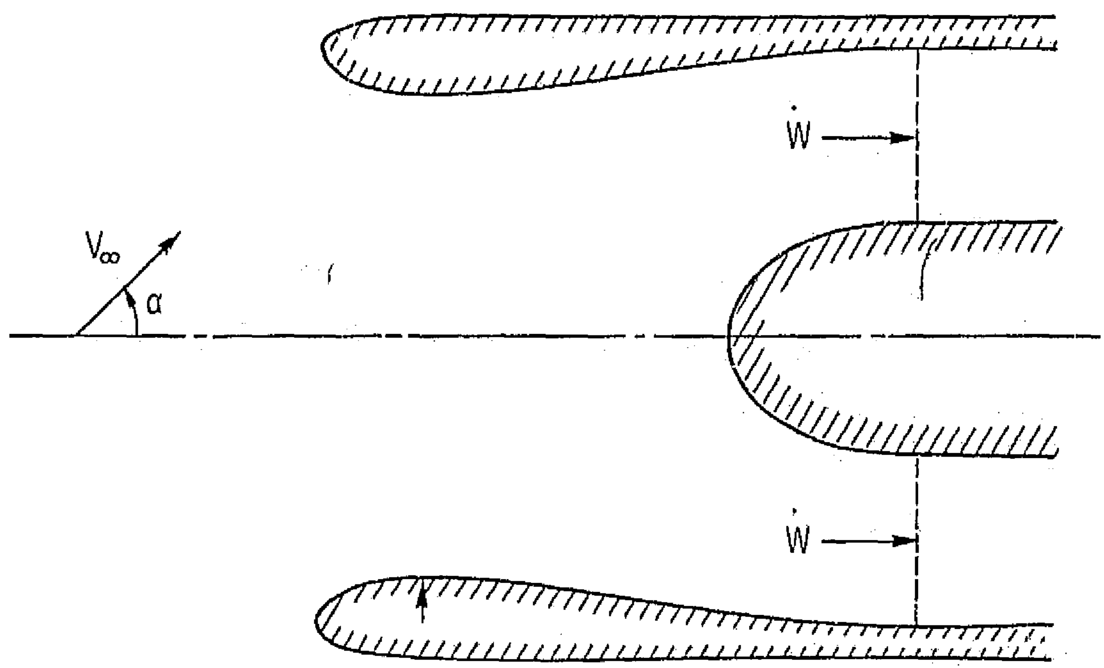
GRAPHIC OUTPUT: -



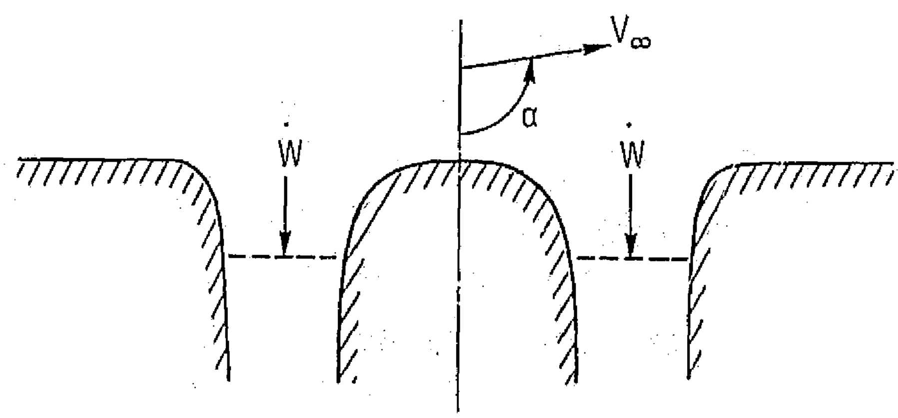
TEST CASE RELEASE 2.0



-#15-
PRESSURE RATIO, PS/PTC
THETA=180.
⊙ - TOWARD FAN FACE
SREF= 12.03
BFQC1
S/SREF
.2
.4
.6
.8
1.0
1.2
1.4
1.6
1.8
2.0
TEST CASE RELEASE 2.0

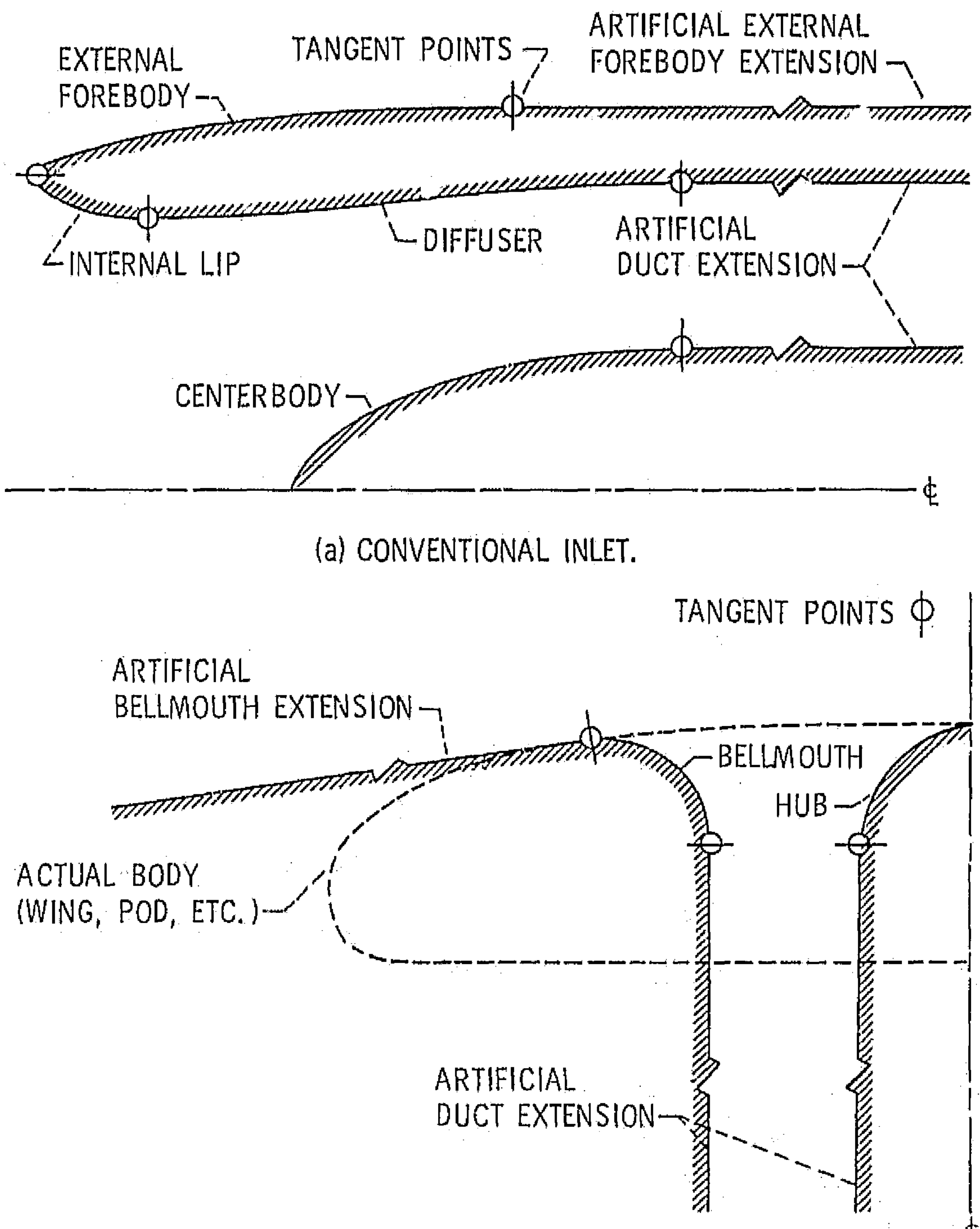


(a) CTOL OR STOL ENGINE INLET.



(b) VTOL ENGINE INLET.

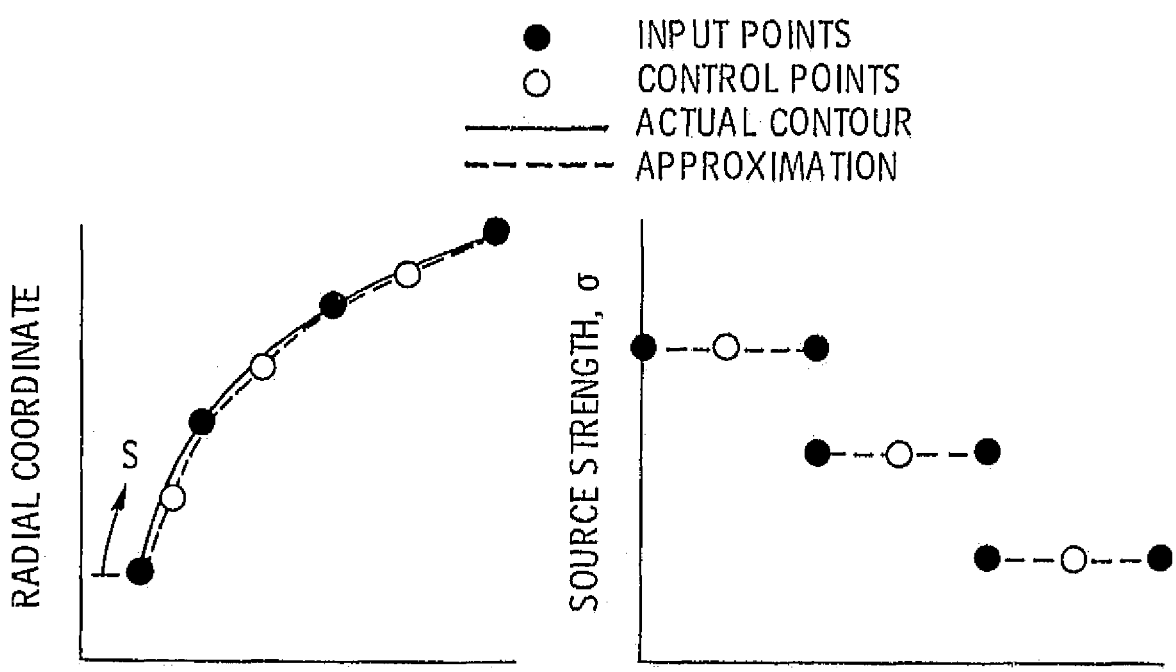
Figure 1. - Inlet geometry and flow conditions for combined solution: inlet mass flow rate, W; free stream velocity, V_∞; and inlet incidence angle, α.



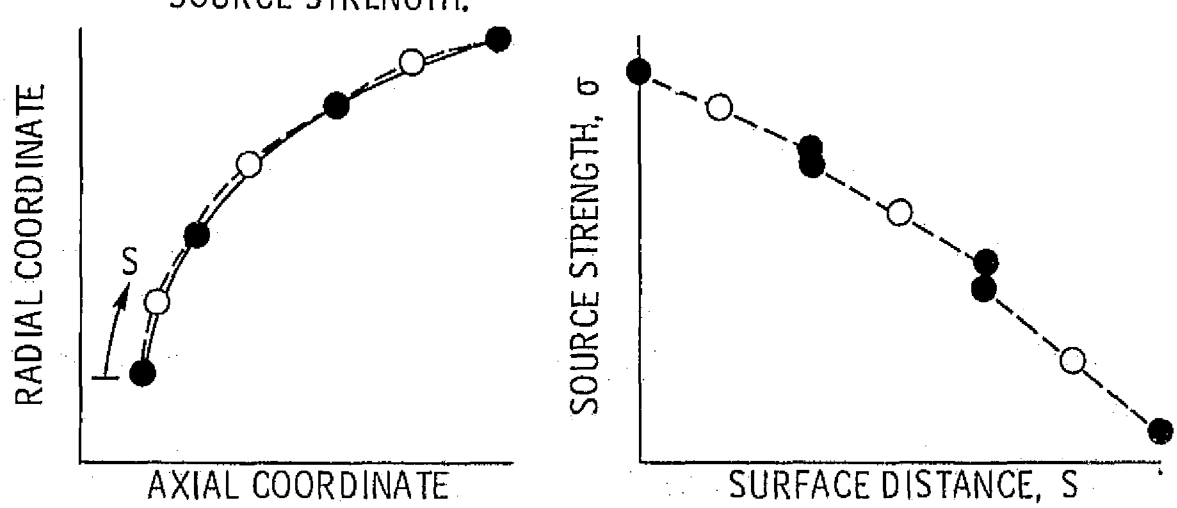
(a) CONVENTIONAL INLET.

(b) VTOL INLET.

Figure 2. - Representative inlet geometries for potential flow solutions.

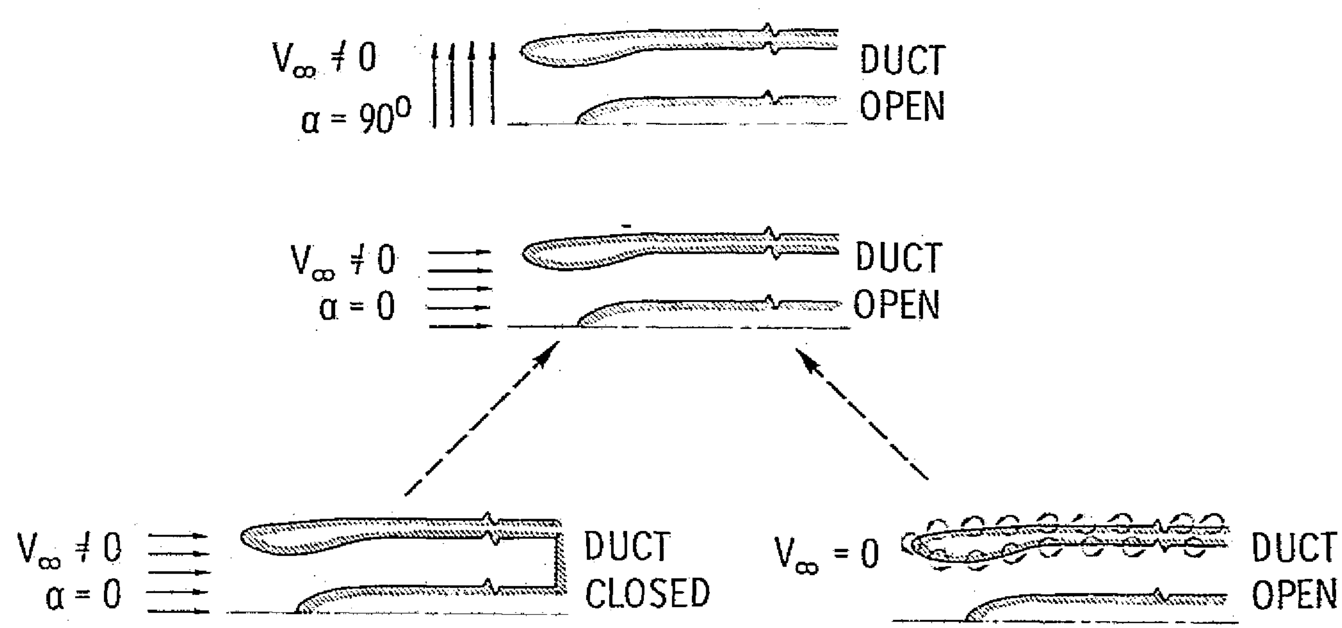


(a) LOWER ORDER METHOD: FLAT (LINEAR) ELEMENT, CONSTANT SOURCE STRENGTH.



(b) HIGHER-ORDER METHOD: CURVED (PARABOLIC) ELEMENT, LINEAR SOURCE STRENGTH.

Figure 3. - Methods of approximating body surface contours and element source variation for basic solutions.



(a) CLOSED-DUCT METHOD.

(b) SHROUD-VORTICITY METHOD.

Figure 4. - Types of basic solutions considered.

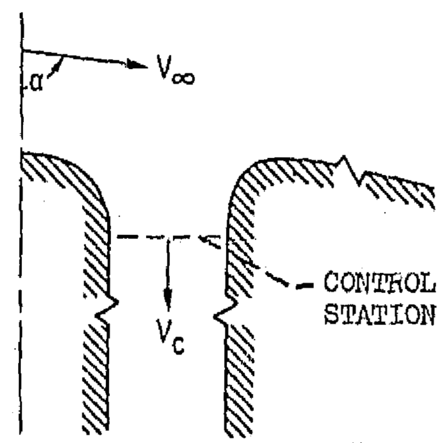
AT ANY POINT, $\overline{V} = A\overline{V}_1 + B\overline{V}_2 + C\overline{V}_3$

A, B, AND C ARE DETERMINED BY SPECIFYING VALUES OF:

V_c AVERAGE AXIAL VELOCITY AT CONTROL STATION

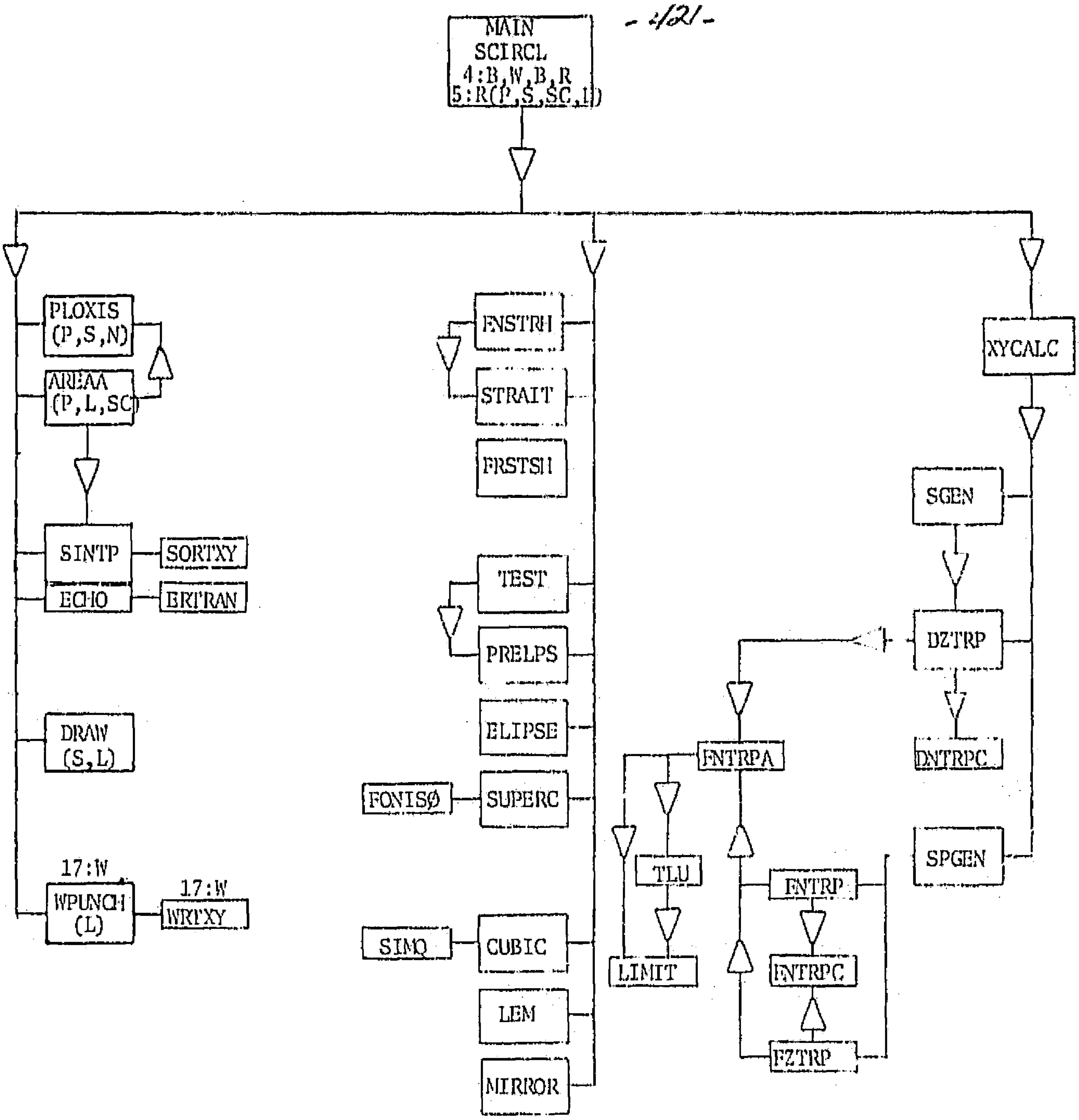
V_∞ MAGNITUDE OF FREE STREAM VELOCITY

α DIRECTION OF FREE STREAM VELOCITY RELATIVE TO THE INLET AXIS



CS-51791

Figure 5. - Combined solution, $\overline{V}$.



a) SCIRCL

5 - I/O Unit No.

B - Rewind

W - Write

R - Read

Calcomp Routines Referenced:

(L) - Line

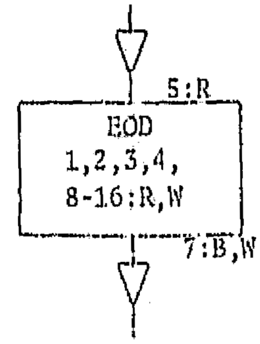
(P) - Plot

(S) - Symbol

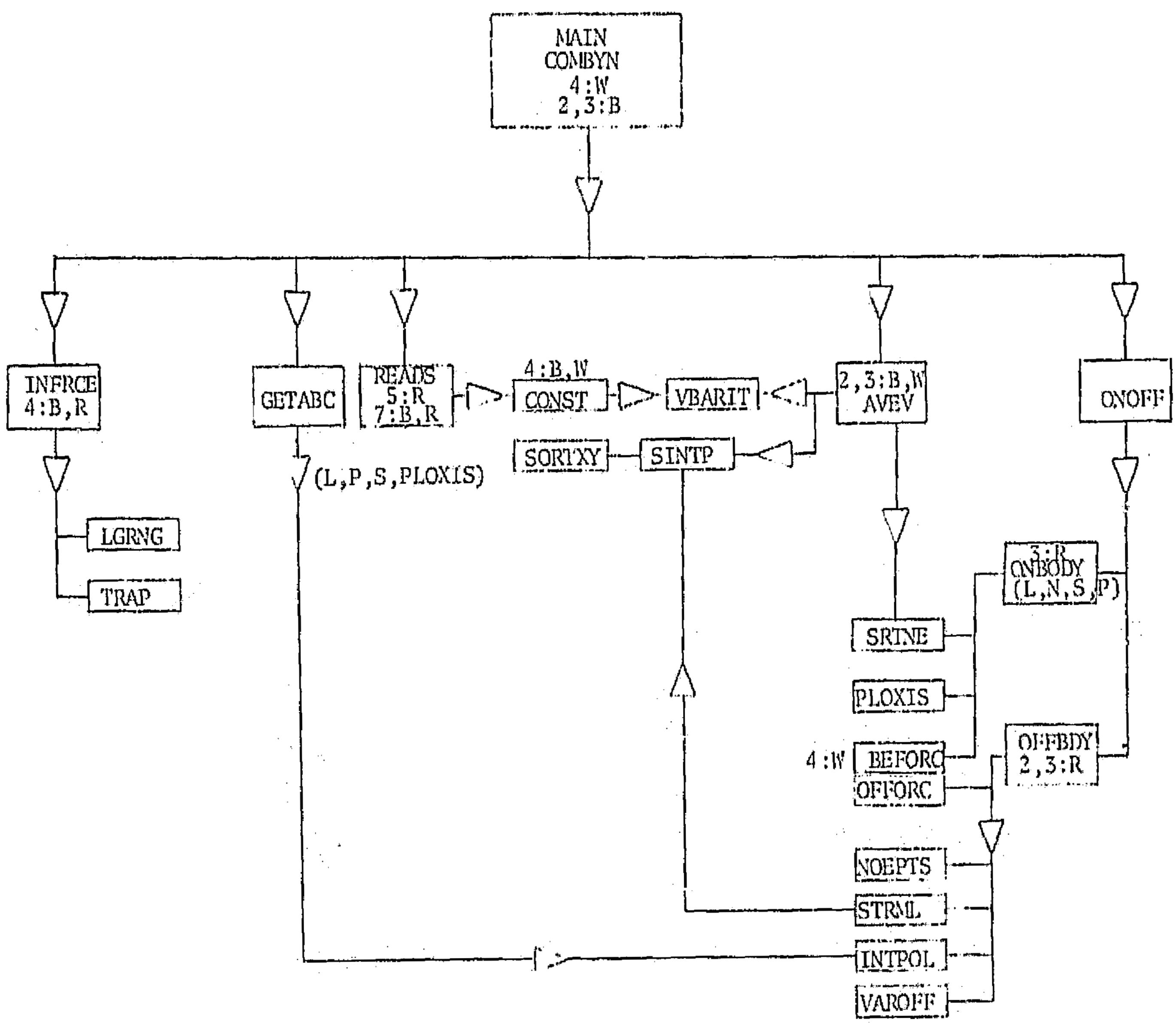
(SC) - Scale

(N) - Number

Figure 6 - CALL SEQUENCES



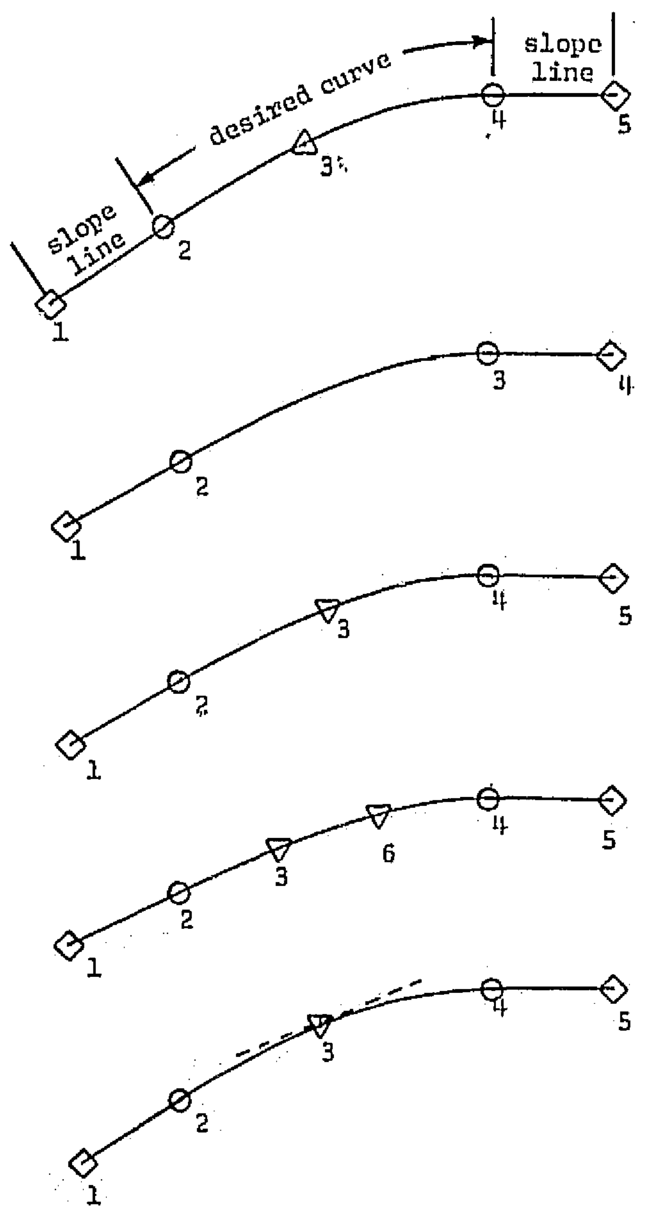
b) EOD



c) COMBYN

Figure 6 - (concluded)

○ Segment endpoints
◇ Slope line endpoints (length of slope line is arbitrary)
△ Optional superellipse point
▽ Optional bisuperellipse point
◺ Optional bisuperellipse inflection point



a) Superellipse optional point (X_3, Y_3) specified. Exponent N calculated.

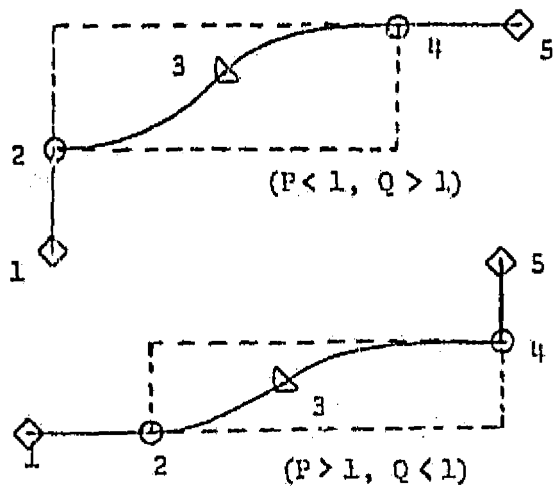
b) Superellipse exponent N or or bisuperellipse exponents P and Q specified.

c) Optional point (X_3, Y_3) and exponent P or Q specified. Exponent Q or P respectively calculated.

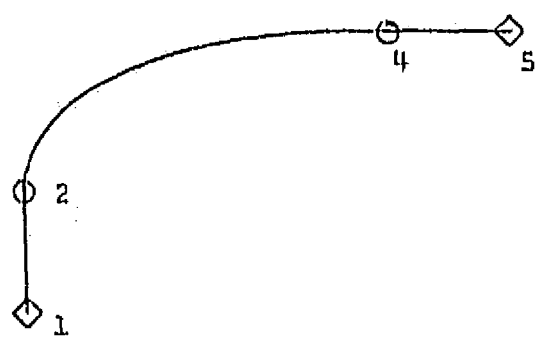
d) Optional points (X_3, Y_3) and (X_6, Y_6) specified. Exponents P and Q calculated.

e) Optional point (X_3, Y_3) and slope $(dy/dx)_3$. Exponents P and Q calculated.

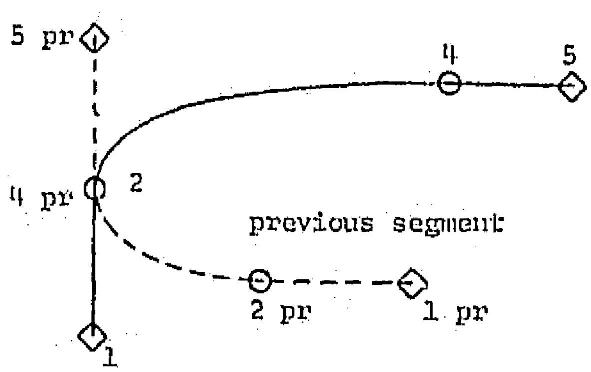
Figure 7. - Sketches for SCIRCL input. Bisuperellipse options.



f) Bisuperellipse with inflection point. Axial location X_3 and slope $(dy/dx)_3$ of inflection points specified. Note that the slope line requirements for this option are different from all other options. One slope line must be perpendicular to curve and one must be tangent, thus there are two possibilities as shown. Both lines must lie away from and outside the 'box' surrounding the desired curve. Also, shown are the exponents that will result in each case.

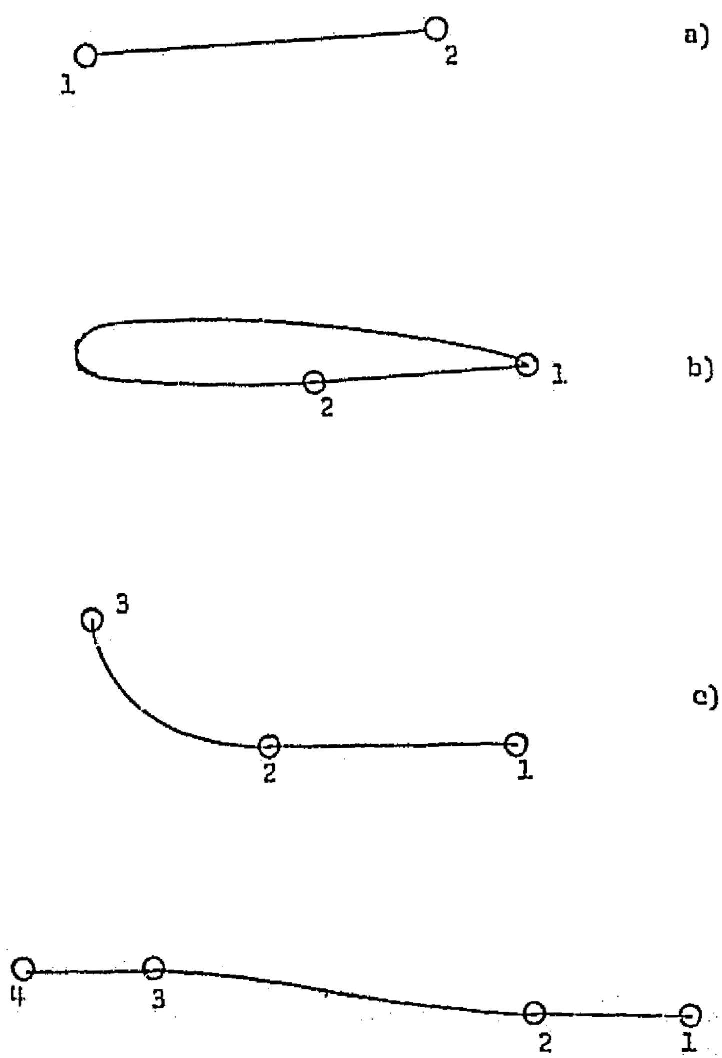


g) Curvature at either point 2 or point 4 specified.



h) Curvature at endpoint 2 matched to internally calculated curvature at endpoint 4 pr of previous segment.

Figure 7. - Concluded.



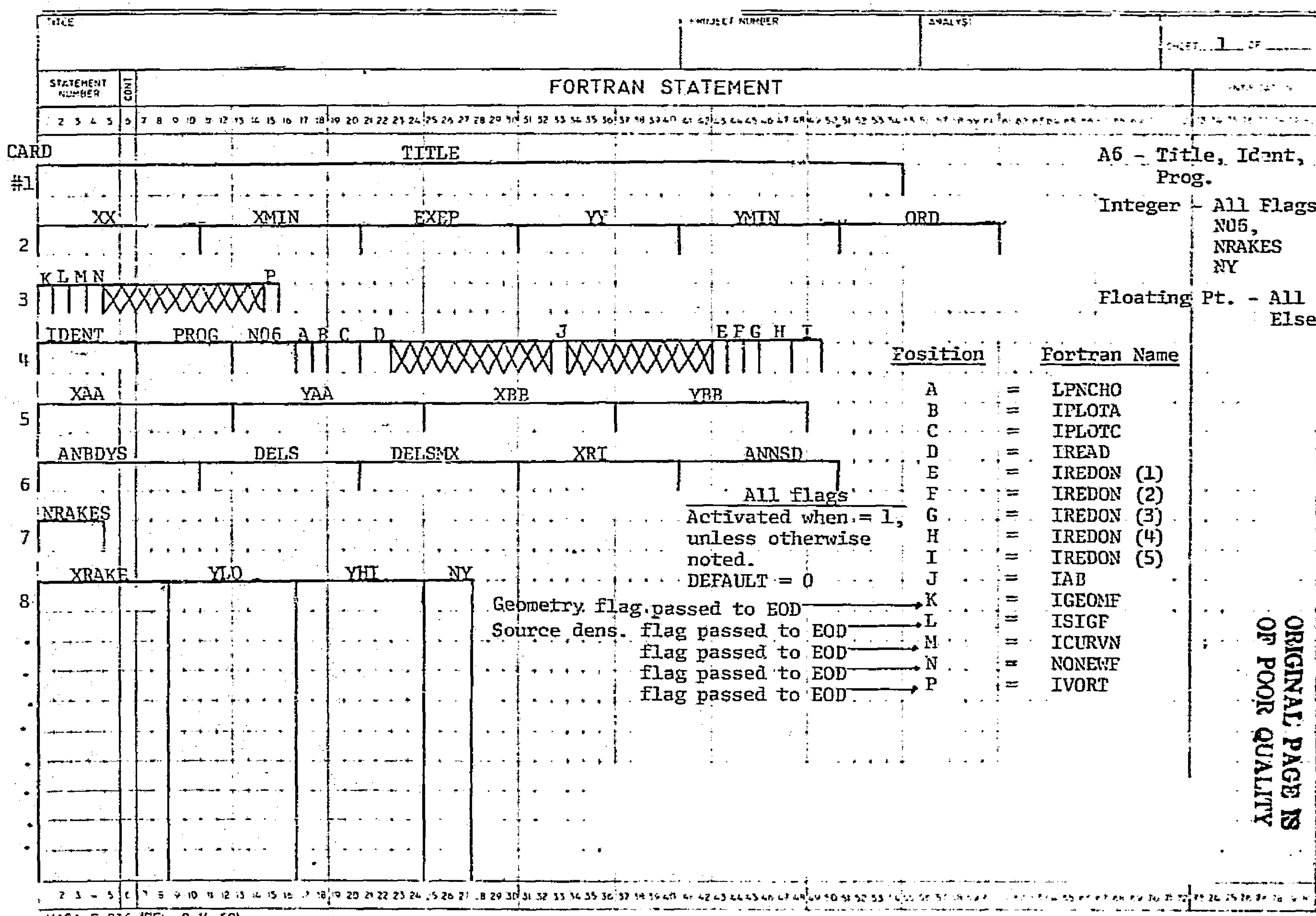
a) Straight line

b) Straight line for closed body

c) Lemniscate

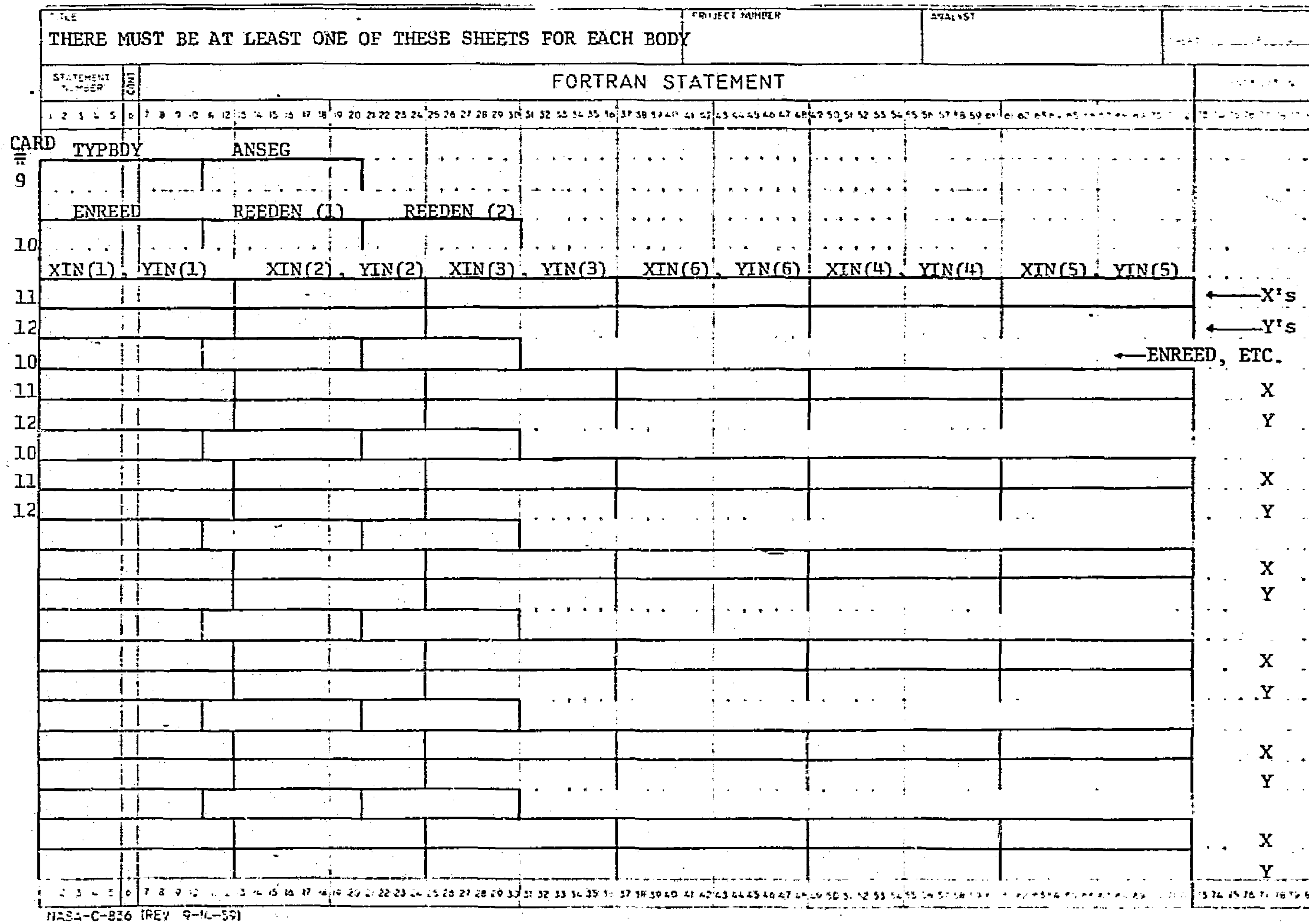
d) Cubic

Figure 8. - Sketches for SCIRCL input options except bisuperellipse



(a) Title, control and rake data cards.

Figure 9. - SCIRCL input layout.



(b) Body and segment data cards.

Figure 9. - Concluded.

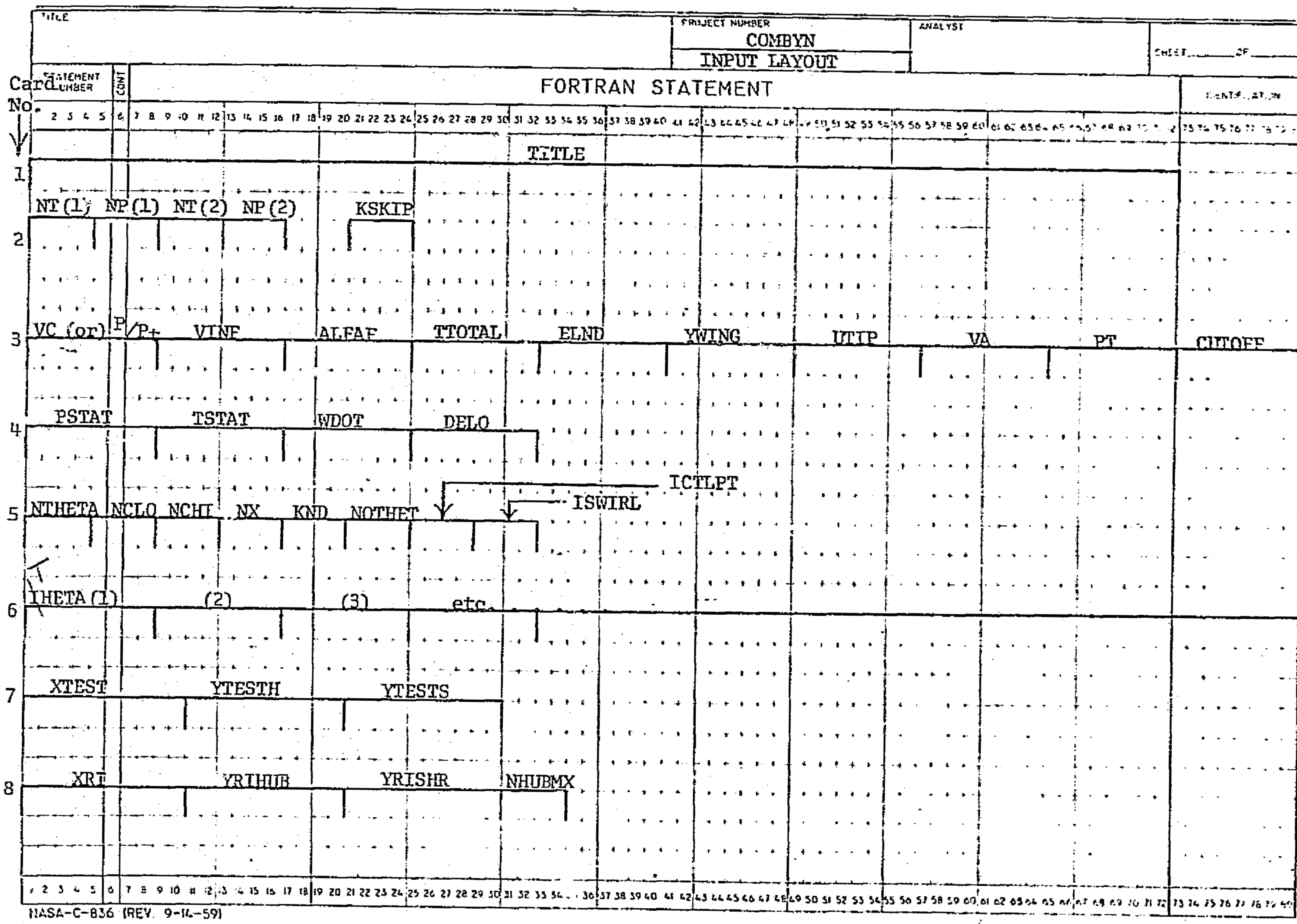


Figure 10. - COMBYN input layout.

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